

AMERICAN AVIATION

November 3, 1958

- 707 Flight: New York to Paris p. 21 • The 707's Powerplants p. 30
Why They Bought the 707 p. 24 • Technical Details on the 707 p. 37

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707



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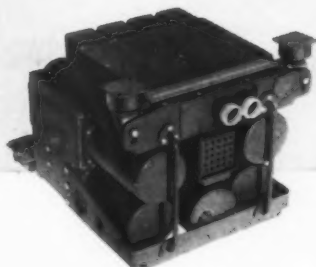
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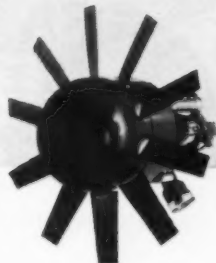
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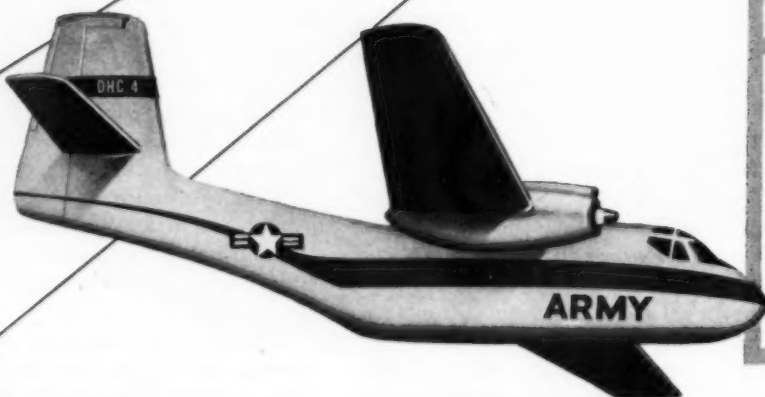
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This Is the Boeing 707

On October 26, some three years and two weeks after it became the first airline to sign on the dotted line for a U.S.-built jet transport, Pan American World Airways led the U.S. airlines into jet passenger service.

A scant three weeks earlier, British Overseas Airways Corp. took the honors for being the first of the world's airlines to introduce jet transportation in transatlantic operations. It was a distinction the British as a nation, the British aircraft industry and BOAC rightly deserved. The comeback of the Comet 4 against the odds created by its earlier misfortunes was no ordinary task. It certainly was one to be justly rewarded by the "first in service" role it achieved.

But for the U.S. and a good share of the world's airlines, the jet era begins with the Boeing 707. For one, the Boeing product from Renton, Wash. represents the jet transport with the most takers. Except for Pan Am and BOAC, large-scale jet service won't begin for some 12 other airlines until they get their 707s. In the U.S. there's American, Braniff, Continental and TWA. On the international scene, there's Air France, Air-India, Sabena, Lufthansa, Qantas, Cubana, Varig and South African Airways.

And then, the 707 unquestionably is the first of the truly big jets in service. Granted that the Comet 4 is fast and speed is the prime reason for jets, but essentially the British jet is not much heavier in gross weight or productive in passenger capacity than the last of the piston transports, Lockheed's 1649A. At the 248,000-lb. maximum ramp gross weight approved for the 707, even this smaller of the Boeing jets is almost 100,000 lbs. heavier than the 1649A. This and the larger 707s and DC-8s to follow within the next 12 months are the tools that will revolutionize world air transport. And only with these tools in hand will the landslide of jet buying decisions of late 1955 and early 1956 begin to pay dividends.

For Boeing, the launching of the U.S. jet transport era with its 707 is, in essence, a comeback surpassing even that of the British with the Comet. True, Boeing took a healthy gamble back in 1952 when it decided to build its prototype jet, but that feat in itself by no means sold the 187 707s and 720s it now has on the books.

There's more to selling the airlines (particularly the U.S. airlines) a new aircraft than simply showing them a prototype. Since the days of the Stratocruiser, the Seattle firm had a reputation for wanting to do things its own way, sometimes a most expensive way by airline standards. Boeing was facing competition from 1,000 miles down the West Coast in Santa Monica, from a company that had the reputation of selling more aircraft to more airlines than any other manufacturer in the world.

This is the real area of the Boeing comeback. From president William E. "Bill" Allen on down the line, the airlines found themselves dealing with something new

at Boeing and something they liked. Instead of telling the customers how the 707 hydraulic system or air-conditioning system should be designed or installed, Boeing engineers traveled in teams to find out what the customers wanted in these systems.

While its competitors were paying top-level sales calls on the airlines, Boeing was penetrating the airline staffs with engineering service and, at the same time, erasing any doubts that it meant business in its re-entry into the commercial transport market. The proof that it did this job convincingly is indelibly inscribed in the order books of its sales department in Seattle.

Against this backdrop of tireless effort and obvious success, the Boeing 707 becomes the proud flag-bearer for the U.S. parade into jet transportation. From this point on, the success of this entire venture transcends the importance of everything else. The 707, the Fairchild F-27, Douglas DC-8, Lockheed Electra and Convair 880 and 600 now become the tools for paving the road back to U.S. leadership in the age of jet transportation. It is how we use these tools that will determine whether this leadership rightfully belongs to us.

We are entering the jet age on a bickering note. Intramural bickering between CAB and CAA over jet performance unfortunately has resulted in a CAB "experiment" with regulations that should never have come to pass. We hope new Federal Aviation Administrator E. R. Quesada will look into this situation in a hurry.

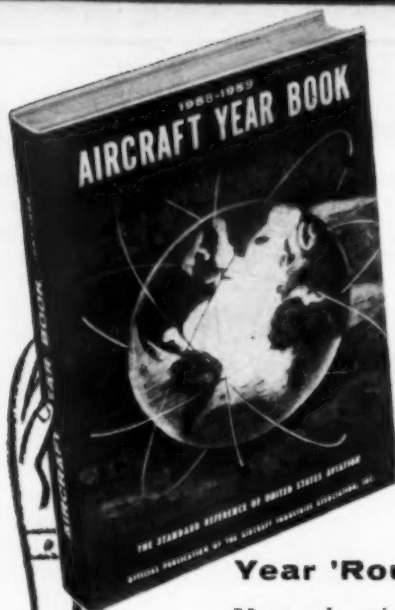
We are bickering about jet noise before we have given a public that wants and must have jet transportation a chance to speak its mind. Jet transportation is no lush promotional scheme designed to fatten the coffers of the aviation industry. It is a service for the public and as much a necessity to the U.S. in world leadership as is our military arm for defense. Squeamish airport authorities should re-examine their consciences on this point lest they cause unnecessary yet permanent damage to our national interests from the start.

We are bickering about crew complements, pilot salaries, air fares and what not, at a period when wrong demands or wrong decisions on any of these issues could jeopardize a successful U.S. jet venture. The important thing is that we do what is right, right now and get on with the job. Let the bargainings, negotiations, hearings and oral arguments of the years ahead amend any inconsistencies that show up with experience.

The Boeing 707 has launched the U.S. into this age of jet transportation. As a tribute to the 707, to Boeing which made the feat possible, and to Pan American World Airways as the first buyer and first flyer of U.S.-built jets, AMERICAN AVIATION has turned over its entire editorial content to the recognition of this event. In other words, "This is the Boeing 707."

Joseph S. Murphy

The regular editorial contributor to this page, Wayne W. Parrish, is currently on an extensive trip through Europe, Poland, the Soviet Union, Afghanistan, and India. In his absence the page will be written by Joseph S. Murphy, Executive Editor.



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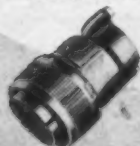
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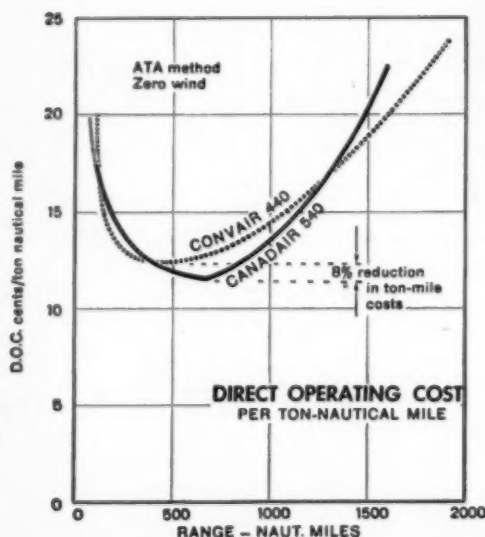
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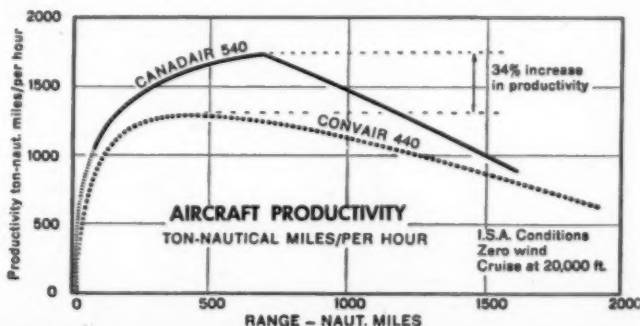
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Graph at left, based on the ATA formula, shows that the direct operating costs of the "540" are as much as 8% lower than the "440". This applies particularly on stages over 400 miles; under 400 miles the graph indicates the two are approximately equal. Not reflected, however, are additional reductions in airframe and engine maintenance costs because of the more basic reliability of turbine engines and a minimum of vibration. This makes the "540" more economical than the "440" over any stage length.

Graph below shows the very definite superiority in aircraft productivity of the Canadair "540" over the "440", which is as much as 34% at their optimum ranges. This indicates that for equal annual utilization the "540" could produce 34% more ton miles; or equivalently, the Canadair "540" fleet size required to do the same job could be reduced by 34%, with a consequent saving in capital investment.



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AIRTRENDS

Navy will place increasing emphasis on the aircraft carrier as a tool which can be used in both little and big wars. It will warn that the submarine and Polaris make a most effective weapon only for use in the event of a major or world war. Objective is to assure first Defense Department, and then Presidential and Congressional approval for construction of the second atomic-powered carrier. Record of Sixth and Seventh Fleets will be used to push the program.

Air Materiel Command will continue trend towards decentralization of buying by headquarters at Wright-Patterson Air Force Base. More and more work will go to the Air Materiel Areas in an effort to bolster the management functions of the headquarters staff. Likelihood is that only major weapon system procurement will ultimately be handled by AMC headquarters during the period when AMC first takes over executive responsibility from ARDC.

Boeing renegotiation case now on trial in Seattle will raise the question cleanly of whether the Renegotiation Board can re-take profits which all stem from incentive payments to the contractor, resulting from savings in costs and production efficiencies under incentive-type contracts. The contractor will ask whether one hand of Government knows or should know what the other hand is doing.

Go-ahead on nuclear propelled aircraft, at least through prototype stage, will be announced soon. Convair Division of General Dynamics can be expected to build two, perhaps three, prototypes. Shielding is still the big headache with estimates indicating that it will involve about 40,000 pounds. Materials to be included in the aircraft in addition to aluminum will be Boron-10, lead and polyethylene in heavy quantities. In the meantime, Navy's evaluation of the possibility of using a nuclear reactor to drive a turboprop engine can be expected soon. Latest requirement for the nuclear-powered aircraft is predicated on its reconnaissance capability. Lockheed will have a place in the program.

Airborne early warning and control systems will be needed to cope with the anticipated threat of missiles and 2,000 mph enemy bombers in the time period 1963-1970, according to Robert A. Bailey, chief engineer of Lockheed Aircraft Corp.'s California Div. Mr. Bailey foresees an off-shore defense combination including long-range supersonic interceptors, Bomarcas and modern AEW & C aircraft.

Air Force is watching for evidence of possible price-fixing. Involved are cases where equal or nearly equal bids for some equipment have been submitted. A number of such cases are now being investigated by the Antitrust Division of the Justice Dept.

Army will fight hard to break the 5,000-lb. limitation which now exists on fixed-wing aircraft, if its current "low and slow" slogan for battlefield reconnaissance stands. It wants aircraft which can carry cameras, infrared and television, as well as nuclear weapons. Lt. Gen. Arthur G. Trudeau, Chief of Army Research, also wants aircraft which can move as silently as possible. As far as the risk is concerned, Gen. Trudeau argues that crews won't be taking any greater risk than the man in the jeep or the infantryman.

Look for a possible deal between the Air Force and the Army in the battle over both air defense and close air support. Gen. O. P. Weyland's (Tactical Air Commander, USAF) critique of the recent weapons meet at Nellis AFB could provide some basis for the decision of the future of the Tactical Air Command as a major factor in the AF organizational structure. Some advocates are arguing that the Army ought to be given its own close air support mission in exchange for bowing out of the air defense field.

Disposal of obsolete, surplus, reciprocating type aircraft is still a major headache in military plans to modernize the airfleet. Concern is market impact of dumping. Plane at the top of Navy and AF's disposal list is the Beech C-45. Odds indicate no sale will be allowed at this time.

AIRTRENDS

Douglas will install leading edge slots experimentally on one DC-8 test aircraft to see if they produce any help on CAR 422A takeoff distance requirements. Whether or not the company will make the installation on production DC-8s depends on test results, but the trend seems to be in this direction. Rumors that the big jet transport's tail is being changed have been vigorously denied by Douglas.

Mach 2.5 cruising speeds for all types of aircraft are seen within the next twenty years by British manufacturers. In preparing for these airplanes, designers are considering the merits of a new powerplant—the turboramjet. This unit would combine the high-speed advantages of the ramjet with the takeoff thrust capability of the turbojet.

Proposals call for integrating the two engine types into the wing structure. The powerplant would occupy the space between upper and lower wing surfaces, which would make essentially a braced biplane structure. The leading edge acts as the air intake, and the trailing edge forms the nozzle. The designer's job is simplified by using common ducts for both engines.

Boeing will be the first aircraft manufacturer to use computers in its spares program. IBM 305 Ramac is used by Boeing's Transport Division to offer speedier spares service to airlines using the 707 and 720. By using Ramac, customers will be able to keep adequate numbers of spares without expensive overstocking.

High cost of duplicate overhaul and test facilities for different models of jet engines is influencing some airline decisions in favor of outside overhaul. One carrier will introduce jets and turboprops and contract all overhaul with engine manufacturer or other overhaul agencies. Reason: equipment to overhaul and test J57 jet engines will run \$2 million and lack of universal shop equipment would require another \$1.6 million to overhaul Allison 501 engines.

Later, as piston engines are phased out of operation, carrier plans to reconsider jet overhaul, expects universal shop

equipment will then be available at considerable cost saving.

Detergent-dispersant oil for aircraft piston engines is being readied for market by Shell Oil Co. Presently in service test, Shell says they have engine manufacturer-approval for the product. Described as being anti-wear, multi-purpose, and of nonmetallic ash base, the oil will be available in 80 and 100 grade. Shell says tests indicate no difference in oil flow or temperature, and there has been no excess of spark-plug fouling.

There's still a good possibility Navy will buy both the Chance Vought F8U-3 Crusader III and the McDonnell F4H. Both have flown more than twice the speed of sound at well above today's operating altitudes. While some Navy sources like the two-engine reliability of the F4H, others are equally impressed by the F8U's successors, the F8U-1 and F8U-2.

North American's A3J flight test program for Navy is reported progressing satisfactorily and one top source in naval operations reports that it is "meeting the specified performance characteristics."

Follow-on for the Navy's new crop of interceptors will be a versatile attack aircraft for which Grumman has received an initial contract. It will be a twin-jet, two-seater powered by Pratt & Whitney J52-Ps.

Aircraft exterior lighting requirements will meet conflicting "expert" opinions when CAB, representatives of manufacturers airlines, ATA and other groups meet to discuss proposed changes of CAR Draft Release No. 58-15 Nov. 3 and 4. The draft release proposes use of high intensity flashing lights as alternates to standard position light and rotating beacon combination if coverage and intensity requirements of both are satisfied. Higher flash rates, now permitted only in overlap zones, would also be extended to all required areas of coverage. In addition, lighting standardization will be considered. It is felt that a domestic standard, compatible with any future international standard, is necessary.



Leading world airlines will fly Boeing Jetliners

Leading world airlines have ordered 184 Boeing jetliners. In addition, MATS has ordered three 707s for use by High U. S. Government officials. This is the largest backlog of jetliner orders in the industry.

There are many reasons for Boeing's leadership. One is that every feature of the 707 has been proved out by

more than four years of prototype test-flying and by flight-testing of production models.

Another reason is that the 707 and the 720 incorporate all of the benefits of the experience Boeing gained building over 1,600 pressurized, multi-engine jet aircraft—more than any other company in the world.

Boeing offers jetliner models for all routes. The 720 for routes of 200 miles and up. The 707 Stratoliner for medium-to-long range routes. The 707 Intercontinental for very long routes.

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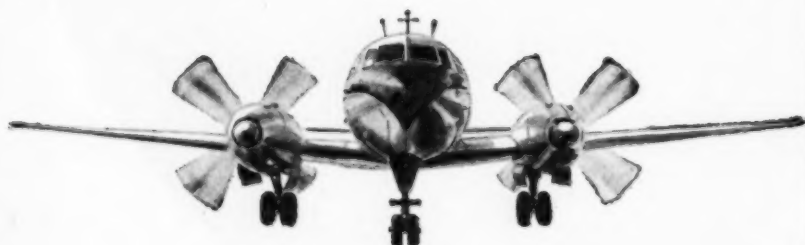
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—LETTERS—

The Serious Airport Problem

Congratulations on your September 22, 1958, issue of *AMERICAN AVIATION* magazine and the vigorous attack on the seriousness of our airport problem. As you know, we consider this probably the most serious economic and safety problem facing aviation.

We have been trying to point out the seriousness of the problem to all affected agencies and individuals for the past four or five years but progress is very slow. It makes very little sense, however, to spend millions of dollars on a new air traffic control system if it is bottlenecked at both ends with an inadequate airport. It makes less sense to buy \$5- and \$6-million airplanes with high cargo and distance capacities but to be unable to take off and utilize these capacities economically because of inadequate runway lengths. However, this is precisely the situation in which we find ourselves and the pressures will undoubtedly be terrific to compromise safety in order to accommodate the financial penalties which will be assessed. This the members of my Association cannot accept in keeping with their responsibility to the traveling public.

Clarence N. Sayen
President

Air Line Pilots Association

A Question of Interpretation

AMERICAN AVIATION of September 8 in an editorial headed "Brashness Personified" criticizes what is described as "an extraordinary and unreasonable request made to the United States" by Qantas. To our surprise we found that this reference was to an application which we have made to the Civil Aeronautics Board for a ruling as to our right, as the holder of a foreign air carrier permit, to pick up international traffic at one, and set it down at another, of the United States points named in our permit.

The question we have raised is one

AMERICAN AVIATION offers these columns to readers for expression of opinion and criticism on the editorial content of this magazine and/or happenings in the aviation industry. Address such correspondence to Joseph S. Murphy, Executive Editor, American Aviation, 1001 Vermont Ave., Washington 5, D.C. Anonymous letters will not be printed; however, names will be withheld on request.

CRC 841



ENERGY ABSORPTION

...the science relating to the cushioning of shock on initial impact... an outstanding advancement that brings aircraft seating in pace with the jet age.

Aerotherm, originally commissioned to initiate the study of E.A., has made significant progress in the field. This principle is now utilized in the production of seats for jet age aircraft.

It is only natural that Aerotherm, manufacturers of the finest aircraft seats in the world, should pioneer in this field.

For full information on this new dimension in safer seating, write our Project Engineers.

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.
THERMIX CALIFORNIA, INC., 5333 Sepulveda Blvd., Culver City, Calif.
Canadian Affiliates: **T. C. CHOWN, LTD.**, Montreal 6, Quebec

THE AEROTHERM CORPORATION
Manufacturers Bantam, Conn.





The quiet, spacious comfort and the incredibly smooth ride of the 707 will delight the whole family. Landings, too, are as smooth as a baby's skin, because the 707 is equipped with *hytrol*, the world's most advanced scientific braking method.



In the time it takes you to enjoy a leisurely meal aboard a Boeing jetliner, you'll span almost half a continent! And *hytrol* will see to it that the final landing moment of your trip is as serene as the flight itself.



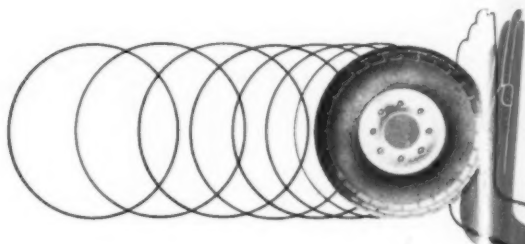
A new kind of luxury awaits you. New spaciousness, new beauty everywhere. And behind the scenes, too, nothing has been spared to give you the ultimate in air travel. *Hytrol*, the accepted anti-skid braking system, is standard equipment on all 707's for that very reason.

Boeing relies

*the accepted anti-skid
braking system...
hytrol ... means
Happy Landings for you*

The comfort of cruising 7 miles up in the 707 will be matched by the comfort of a landing masterminded by the accepted anti-skid braking system...proved as standard equipment on such military aircraft as the KC-135, B-52, B-47, F-101, A3D, RF-84F, F-100, C-118, C-130, QF-80. *Hytrol's* "happy landings" will help you sell more airline tickets in the competitive jet age that is now a reality. And *Hytrol*—compatible with all present aircraft and braking systems in commercial use—can offer your passengers this jet age comfort on your other airplanes as well.

With a full decade of highly specialized anti-skid braking experience under its belt, Hydro-Aire today ranks as the world's foremost expert in this important aviation development. An outstanding staff of development, production and field-service engineers now monitor *Hytrol* installations on more than 8,000 aircraft presently in service—and are fully qualified to handle the requirements of the commercial airlines that will be using *Hytrol* on all jet transports.



elion *hytrol* for the 707 jetliner



Hydro-Aire, pioneer in the concept of smoother, scientific landings through *hytrol*, takes this opportunity to salute Boeing Airplane Company and Pan American World Airways — pioneers in the American age of jet flight. Upon the following airlines will offer their passengers the superb comfort and ultimate luxury of Boeing's jetliners, and with it the happier landings made possible by *hytrol*: Air France, Air-India International, American Airlines, Braniff International Airways, British Overseas Airways Corporation, Continental Air Lines, Cubana De Aviacion, Lufthansa German Airlines, Pan American World Airways, Qantas Empire Airways, Sabena Belgian World Airlines, South African Airways, Trans World Airlines, United Air Lines, Varig Airlines of Brazil.

HYDRO-AIRE

BURBANK, CALIFORNIA
Aviation Subsidiary of CRANE
Anti-Skid Braking Systems • Fuel
System Controls • Pneumatic
Controls • Actuation Systems
Electronic Devices

PRODUCING CONTROLS FOR EVERY BASIC AIRBORNE SYSTEM



The Boeing 707 jet airliner towers over Shell's jet fuel truck.

AeroShell Turbine Fuels for the Jet Age

The Boeing 707—America's first jet airliner scheduled for passenger service is ushering in the commercial Jet Age.

Ready to serve these new jets wherever they fly are AeroShell Turbine Fuels developed especially by Shell to meet the exacting requirements of this new Jet Age. Shell guards the quality of these fuels by special handling techniques, developed in Shell's unique AeroShell Turbine Fuel Equipment Laboratory.

WRITE FOR FREE LEAFLET

"FUELING
THE
BOEING
707"



This step-by-step picture story shows how single-point fueling works.

SHELL OIL COMPANY

50 WEST 50th STREET, NEW YORK 20, N. Y.
100 BUSH STREET, SAN FRANCISCO 6, CALIF.



—LETTERS—

of legal interpretation; we have filed our submissions with the Board and we feel that it would not be proper for us to enter into a discussion of the merits of our case in the press. However, there are two statements in your editorial to which, in fairness, we think we should be given the opportunity of replying.

You say that Australia promptly denies all applicants rights of the nature involved in this proceeding before the Board. While a claim to this effect is made in the material filed in opposition to our application, we have, in our comments to the Board, replied that this claim has no foundation.

Your editorial concludes with the statement that our action in raising this question "was beneath the stature and fair play for which Australians are generally known." What we have done is simply to make a formal application to the Board for a decision on the legal validity of our interpretation of our rights under the permit issued to us by the Board. Any other interested parties had the right to submit their views to the Board, and a number of such submissions have been made both in support of and in opposition to our interpretation. So far from having anything improper or unfair about it we feel that this proceeding is the only satisfactory method by which this issue can be resolved.

C. O. Turner
Chief Executive's Office
Qantas Empire Airways
Sydney, Australia

When & Where

NOVEMBER

National Defense Transportation Assn. annual national convention and logistics forum, St. Louis, Nov. 9-12.

School of Aviation Medicine, international conference, San Antonio, Tex., Nov. 10-12.

Flight Safety Foundation, annual international air safety seminar, in cooperation with Airways Modernization Board, Atlantic City, N.J., Nov. 10-13.

Aircraft Industries Assn., board of governors annual meeting, Phoenix, Ariz., Nov. 16-18.

American Society for Quality Control, annual aircraft and missile division conference, Biltmore Hotel, Dayton, O., Nov. 17-18.

Aviation Distributors and Manufacturers Assn., meeting, Dallas, Tex., Nov. 18-20.

Canadian Aeronautical Institute—IAS, joint meeting, Chateau Laurier, Ottawa, Oct. 7-8.

Air Transport Assn., engineering and maintenance conference, Eden Roc Hotel, Miami, Oct. 7-9.

Sixth International communications meeting, Genoa, Italy, Oct. 7-12.

International Air Transport Assn., public relations conference, Hamburg, Germany, Nov. 24-27.

DECEMBER

American Rocket Society, annual meeting, Hotel Statler, New York City, Dec. 1-5.

Airline Electronics Engineering Committee meeting, Hotel Statler, Washington, D.C., Dec. 4.

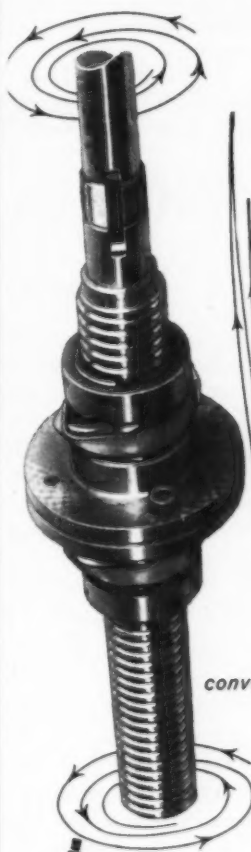
Flight Engineers International Assn., anniversary banquet, New York City, Dec. 7.

Institute of Aeronautical Sciences, Wright Brothers lecture, Washington, D.C., Dec. 17.

the **BOEING 707**



—on take-off
—in flight
—on landing



BEAVER BALL SCREWS ARE CONSTANTLY AT WORK FOR BETTER CONTROL OF VITAL OPERATING PARTS

Where precision actuating control, free of backlash and springiness is imperative, where optimum in positioning accuracy is demanded, where high efficiency is important in reducing weight requirements in the drive system—you'll find Beaver Ball Screws on the job.

Whatever your product, if any or all of these requirements exist, we suggest you get the full story on Beaver. Here may well lie the solution to a long standing problem in your design.

Our engineers with their extensive experience are available for consultation. Consult Sweet's Industrial File or write for our catalog.

Beaver Precision Products
INC.
CLAWSON, MICH.

BUILDERS OF PRECISION BALL SCREWS FOR

operating control and ground handling of many major commercial and military aircraft as well as for control, ground handling and flight plotting of many rockets and missiles.

Circle No. 17 on Reader Service Card.



B.F. Goodrich



B. F. Goodrich Fabric Tread Dimple Tire proved "far superior" in F-106 tests

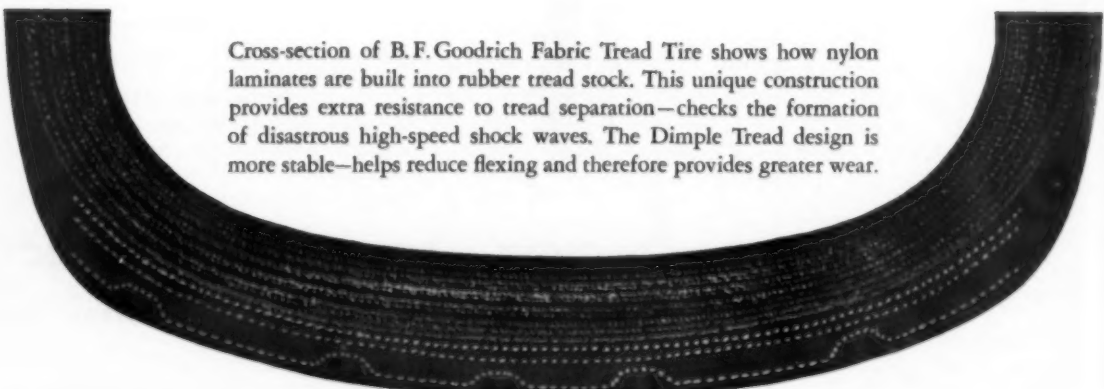
Ordinary high-performance tires used on the F-106 built by Convair, a division of General Dynamics Corporation, just couldn't take the punishment. The stress of high-speed takeoffs and landings literally tore them to pieces.

Then B.F. Goodrich submitted its revolutionary new Fabric Tread Dimple Tire for testing. Even under severe operating conditions, including repeated RTO situations, the tire proved that it could out-perform and out-wear any jet tire known today. As a result, the B.F. Goodrich Fabric Tread Dimple Tire is standard equipment on the F-106 Delta Dart, world's fastest and highest flying all-weather interceptor.

The amazing performance of the B.F. Goodrich Fabric

Tread Dimple Tire is made possible by two exclusive features. Plies of nylon cord are built right into the rubber tread stock to equalize the modulus between tread and carcass. This cuts the amount of heat normally generated by flexing between the two elements of the tire. In addition, the special Dimple Tread design eliminates stress points in the tread and therefore provides greater resistance to cutting and chipping.

B.F. Goodrich Fabric Tread Tires mean safer takeoffs, more landings, for supersonic aircraft of all kinds. Available with either Dimple or Sineweave Tread design. For more information, write B.F. Goodrich Aviation Products, a division of The B. F. Goodrich Company, Akron, Ohio.



Cross-section of B.F. Goodrich Fabric Tread Tire shows how nylon laminates are built into rubber tread stock. This unique construction provides extra resistance to tread separation—checks the formation of disastrous high-speed shock waves. The Dimple Tread design is more stable—helps reduce flexing and therefore provides greater wear.

B.F. Goodrich aviation products

Pan American World Airways Flight 114, a 7 p.m. departure for Paris, eased off the runway at New York's Idlewild Airport on October 26 and wrote into the record a new era in U.S. air transport.

The aircraft, Boeing 707 Jet Clipper America, with Pan Am's Atlantic Division chief pilot S. H. "Sam" Miller at the controls, was carrying the first fare-paying passengers to fly in a U.S.-built JT in scheduled airline service.

Aboard the 707—From New York to Paris

By Joseph S. Murphy
Executive Editor

From takeoff to landing, Pan American's Boeing 707 jet service is a new treat for transatlantic air passengers. In every respect—aircraft performance, cabin interior design and comfort, noise and vibration—the big Boeing jet is inking the "obsolete" stamp on all predecessor piston transports, particularly in longer range international operations.

This was immediately apparent on October 20 when PAA gave this reporter and 109 others a pre-inaugural showing of jet service across the Atlantic.

The entire operation, from departure at Idlewild through a stopover at Santa Maria, Azores to landing at Paris' Le Bourget was a study in contrasts. It was one of a new and modern jet being served from airport facilities that become outmoded with its introduction.

At Idlewild, the 707 weighed in at 230,400 lbs., more than 7,000 lbs. below its approved gross weight for a zero-wind takeoff from Idlewild's 8,900-ft. runway 13R.

• **Anti-noise precaution**—The reason: Reduced fuel load calculated as necessary to permit climb to 1,200 ft. within the four to five-mile bounds laid down by the Port Authority as an anti-noise measure.

At takeoff power, while the 707's Pratt & Whitney J57s are consuming kerosene at the rate of 48,000 lbs. per hour, the sensation to the passenger is impressive but not disturbing. The 707's acceleration to approximately 160-knot lift-off speed is rapid and reassuring and compares with about 118 knots for the Douglas DC-7.

On the demonstration flight, Jet Clipper Mayflower, flown by 18,000-hr. veteran Ben S. Harrell, accelerated to 100 knots in 29.5 seconds, used only 6,450 of the available 8,900 ft. runway. Harrell climbed to 25,000 ft. in 26 minutes, proceeded to Santa Maria using a fuel-saving step climb at 27,000, 29,000 then 33,000 ft.

On the 2,270 nautical mile trip to the Azores, the 707 flew 5:07 hours, averaging 510 miles per hour. On the subsequent 1,408 N.M. leg to Paris, the time was 3:30 hrs. and speed 518 mph.

Mechanically, PAA crew members report, the 707 is writing a good record. The only problems encountered on the demonstration flight involved minor switch malfunction of the PB-20 autopilot and three inoperative buffet liquid containers. Both items were corrected by flight engineer S. J. Sabalis while en route.

• **For the passengers**—The 707 interior, arranged for 40 de luxe and 70 economy fare passengers, gives the impression of lower capacity than many 70 and 80 passenger coach aircraft now flying U.S. domestic routes. Even in the six-abreast aft economy fare section, the narrower seats produced for PAA by Aerotherm Corp. provide a high degree of comfort. Wider than usual aisles erase the customary congested appearance of this compartment.

The 707 buffet, developed for PAA by Nordskog, proved amply capable of handling the 110 meals on what normally would not be a meal-for-all flight. The speed of the jet is such that flight planning will no longer require serving two different meals on a given trip, hence PAA will be able to serve larger numbers of passengers with essentially the same size buffets.

The interior decor, except for the elimination of some of the more modernistic wall patterns shown on interior mockups, follows the interior architecture designed for Boeing by consultant Walter Dorwin Teague Associates. Overhead passenger service pods have been reduced several inches in depth, house "pop-out" oxygen masks in event of decompression, and provide well-focused reading lights even for three-abreast seating.

Cabin finish in general is conservative, varying from a gray vinyl wall covering below the windows to white from sill level up to a blue ceiling. Giant oval-shaped centerline dome lights, originally proposed in the mock-up, have been retained by PAA.

• **Improving operations**—Along operational lines, Pan American's Asst. v.p.-communications Waldo Lynch is wasting no time moving ahead on improved nav aids for the 707. After recent tests of several Doppler self-con-

tained navigation systems in piston-transport test beds, PAA placed an order with Canadian Marconi for its Doppler nav aid and the first delivery is due to Pan Am about November 15.

• **The commercial inauguration**—The October 26 jet inaugural marked the long-awaited advent of the jet on the U.S. airline scene, but when it arrived, it was not without its drawbacks.

For one, Capt. S. H. Miller and pilot crew were all Pan Am supervisory personnel, hand-picked from a group of 22 that are being checked out on the 707. Regular PAA Pilots and copilots were not on hand for the jet inaugural and won't be until the airline and Air Line Pilots Association iron out a contract dispute now deadlocked over jet wages and crew complement.

Pan American is planning to operate all jet flights with supervisory pilots, but with additional schedules being introduced this type operation will be limited.

On the day after the eastbound inaugural, Pan American flight 115 departed Paris for New York to commence one-a-day transatlantic jet operation with its fleet of two aircraft.

• **More jets to come**—On October 30 PAA received its third 707, expects No. 4 on November 15, the day before it will launch New York-London nonstop operations. At this rate, the carrier obviously will face manning problems within 30 to 45 days unless it gains the services of its complete roster of 1,600 pilots.

Pan American's No. 2 jet problem involves noise and the controversial restrictions imposed on the 707 by the Port of New York Authority. Although the Boeing jet would be capable of New York-Paris nonstop on 85 to 90% of eastbound flights with favorable winds, the local PNYA ultimatums are necessitating one-stop service to the French capital.

With its Boeing 707 introduction now a matter of history, Pan Am has one more big jet inaugural heading its way. As part of its \$300 million jet investment, the airline will be first to take delivery of Douglas DC-8s and will introduce them into service within the next 12 months on its Pacific Division.

FIRST ON THE ATLANTIC...FIRST ON THE PACIFIC...



PAN AM JET CLIPPERS-A

Right now

FASTEST TO PARIS

Starting Nov. 16

FASTEST TO LONDON

The Pan Am 707 Jet Clipper* is the fastest, most powerful commercial jet aircraft in regular transatlantic service. Its inaugural flight marks an important first for America in the dawning age of international jet travel. Pioneering new equipment, new routes, new methods has been a Pan

FIRST IN LATIN AMERICA...FIRST 'ROUND THE WORLD



The first Jet Clippers are Boeing 707s, the most thoroughly flight-tested aircraft ever to enter commercial service.

S-FASTEST TO EUROPE

fastest ocean tradition for 31 years. Today the
ial jet faith in the future of aviation guides
ce. Its company in 1927, when a Pan Am
first for F-7 fly the 90-mile route across
national traits of Florida to Havana to become
nt, new era's first "overseas" airline.

*Trade-Mark, Reg. U. S. Pat. Off.



WORLD'S MOST
EXPERIENCED AIRLINE

NOVEMBER 3, 1958

Why Did They Buy the Boeing 707?

"Why did your airline buy the Boeing 707?" This is the question that AMERICAN AVIATION asked of top officials in 15 companies. The specific reasons given by those that replied are printed below.

Air France: Max Hymans, Chairman of the Board



In my opinion, to make a choice is far more important than the reasons which make it necessary.

Thence, the difficulty to answer your question. To give a precise and thorough answer would require a complete reconstitution of all preliminary technical research and of all the meetings, in the

course of which my collaborators, Air France administrative heads, and myself, confronted opinions.

However, there are three outstanding reasons which led me to personally choose the Boeing 707:

1. The Builder's Experience: Boeing has since World War II specialized in the construction of heavy jet aircraft. In particular, the six-jet powered B-47s and the eight-jet powered B-52s, giving such outstanding services to the United States Air Force.

2. The Aircraft Flew: This allowed for direct appreciations of its qualities. The Boeing 707 being the commercial version of the KC-135 tanker, it was possible to have an idea of the aircraft behavior.

3. Delivery Delays: Relatively short, of great interest to airline companies.

Braniff International Airways: Chas. E. Beard, President



Our selection of the Boeing 707 resulted from studies of the operating performance of jet aircraft then available,

based on factory furnished data, over our particular routes and between the particular terminals where we contemplate operating it together with its compatibility with both our domestic and international operations. The important factors were range and lift capacity in relation to the airports we expect to use in their present condition without major runway modification and its reserve power for obvious advantages.

Price was important but secondary.

Since, based upon the reports and recommendations of our own engineers, the J57 engine was essential to the standards of performance we planned, delivery had no particular bearing on the final decision although it would have been most significant had we concluded that the J57 was suited to our operations.

Qantas Empire Airways: C. O. Turner, Chief Executive



Qantas ordered the Boeing 707 because it offered an ideal combination of delivery, size, speed, range, payload and passenger appeal.

In deciding, Qantas was impressed by the unmatched experience of Boeing in designing and manufacturing a long line

of heavy multi-engined aircraft of which the B-17, B-29, B-50, C-97, B-47, B-52 and KC-135 are examples. The value of the 707 prototype was also assessed, as was the advantage of a large order for the KC-135 tankers which are very similar to Qantas aircraft.

Impressive also were the prospects of the Pratt & Whitney J57 engine which will power the Qantas fleet. Never before has the opportunity been available to introduce to commercial service engines with a background of proving and development exceeding 20,000,000 hours of operation and a promise of reliability, economy and power growth.

In choosing the Boeing, Qantas was also able to be the first—other than a U.S. airline—to operate the new type jets and to offer this vastly improved medium to its passengers on round-the-world services.

American Airlines: C. R. Smith, President



American's decision to purchase the Boeing 707 for its Jet Flagship fleet was based on a number of factors. Among these were:

Boeing has built more large jets and has had more experience in that field; Boeing developed a prototype, which others did not do, and, as a result, more was known about the 707 than about other types—it was more thoroughly tested.

American's management also believes the 707 is the "right size" for the domestic markets the airline serves.

In addition, the combination of the 707 and the J57 engine was an advantageous and economical one, because the J57 has a superior record of service.

Varig Airlines Ruben M. Berta, President



Varig bought the Boeing 707-420 (extended body, 311,000 lbs. gross, intercontinental range) because the company felt that to face competition it needed a seasoned product capable of flying direct one of the most extended routes flown by any carrier without penalizing the payload or jeopardizing operational reserves.

Varig chose the Conway engine because of the long-established reputation of Rolls-Royce, because it improved the payload-reserve fuel situation by around 4,000 lbs., and also because of the readiness of the English corporation to build an overhaul shop for all their products in Brazil.

**Cubana Air Lines, Inc.:
José López Vilaboy, President**



As a healthy, vigorous airline with long-range plans and long routes spanning the Caribbean and the Atlantic, Cubana inevitably has turned to the latest types of aircraft.

The Boeing 707, we felt, is ideally suited for our Mexico-Havana-Europe and Havana-New York routes. Besides the greater speed, the plane will give us the additional seating capacity needed in our peak seasons.

Operating from our hub in Havana, we can also project routes with this new equipment that will tie several continents together, as well as add onto present routes. Route extensions into other parts of Europe and northward into Canada, for example, will be accelerated by jets.

Our pilot and maintenance experience with turboprops will enable us to ease into the pure-jet expansion phase without some of the problems that may beset other carriers.

**Continental Air Lines:
Robert F. Six, President**



In its planning for purchase of jet equipment for operations in 1959, Continental Air Lines was impressed by the success of the Boeing Airplane Co. in its many years of experience in the production of multi-jet aircraft.

In the 707, Boeing offered Continental the combined elements of speed, economy, passenger appeal, ease of maintenance and simplicity of operations that we believed to be characteristics of a jet transport plane ideally adapted to our routes. These features were emphasized in the

707 to a greater degree than in any other jet transport evaluated by Continental.

Boeing guaranteed us earlier delivery dates than any other manufacturer; dates which will enable us to enhance our competitive position in the industry to a marked degree. These advantages, coupled with lower airframe costs and lower direct

British Overseas Airways Corp.: Sir Gerard d'Erlanger, Chm.

BOAC's direct interest in the large jet transport became necessary immediately it appeared that the corporation's plans for expansion with the Britannia and Comet series, and for progressive development of these types, might be competitively "leap-frogged" on the North Atlantic.

Interest became more specific as studies showed the likelihood that this competitive, large-capacity aircraft, with first costs held down by the scale of the production programmes, would offer in due course highly competitive seat-mile costs on North Atlantic routes where the aircraft output could be absorbed.

Our choice was influenced to some degree by the apparent lead time Boeing had on the development of the 707 and

operating costs as evidenced by the experience with the 707 prototype airplane, were instrumental in our decision.

We believe that Boeing's unequalled experience in the manufacture and operation of large multi-jet aircraft assures us of a jet airliner ready for immediate and profitable operations.



its equipment and also by our years of fruitful association with Boeing in successful Stratocruiser operations on the North Atlantic.

Lufthansa German Airlines: Gerhard Holtje, Chief Executive

When the jet age came . . . it was obvious that Lufthansa could not stay behind and had to make an early decision. We picked the Boeing 707 because we liked it best of all the jet planes which then were offered by the aircraft industry. And we liked it best because we became convinced that no other long-range jet would serve our interests more adequately.

Boeing undoubtedly is the manufacturer with the most experience in designing and building heavy multi-engined jet aircraft. Another big point in Boeing's favor was the fact that a prototype of the 707 had been flying since 1954 and had provided a solid foundation for the performance estimates.

The Rolls-Royce Conway engine chosen by us promised apart from the excellent reputation of its manufacturer a small but significant increase in range which is valuable to us.



Sabena Belgian World Airlines: Willem Deswarte, President

The reason why we have ordered big jets is because we believe in our industry's future.

Economically speaking, civil aviation will only be prosperous when travel by air will no longer be the privilege of a "happy few," but, on the contrary, the normal, daily and usual way of transportation for the man in the street and for most freight.

Ideally, we must aim at the time when distance, time or price will no longer be an obstacle to the unification of the world.

Consequently, we chose the quadri-jet because it represents a big step forward in both cases.

We considered that Boeing had greater experience in heavy jet construction and more especially with respect to the tanker which already had a good number of flying hours to its credit and from which the Boeing 707 is derived.



We considered that Boeing had made more progress in the realization of the big intercontinental jet which we needed, and this is what turned the scale in favor of the Boeing 707.

How They're Promoting Travel on 707s

Pan American's promotion and advertising budget will run about \$2 million and American is not far behind

Acquainting the public with the first U.S. jet transport to enter service—the Boeing 707—was not an overnight job. Nor has it been inexpensive.

Before the year-end, Pan American World Airways, first international operator, will have spent considerably more than \$2 million, and American Airlines, first transcontinental, almost \$2 million on jet advertising and sales promotion. PAA says its program is the "largest and most concentrated single advertising promotion in the history of air transportation." AA's is the "largest single advertising effort in its history."

PAA swung into its promotional program many months ago. Interestingly, the first phase involved cereal box-tops. And as the campaign reached a peak, some idea of its scope could be seen from the fact that it included:

- Double trucks or facing half pages in 64 newspapers and 56 foreign language papers in the U.S. and Canada, at least a dozen national magazines, 219 newspapers and 80 magazines in Europe, Africa and the Middle East.
- 430 billboards overseas.
- And direct mail material is going to hundreds of thousands of names.

• **PAA Promotion**—PAA's first promotion was with Kellogg's Cornflakes. The Jet Clipper was featured on some 60 million packages of cornflakes sold through almost 300,000 outlets. "The idea," explains PAA promotion director Stanley Washburn, "was to get on the breakfast table of the nation." Kids got a plastic 707 model for a box-top and 50¢. This big prize, for a family of five, was a trip abroad on the first jet scheduled, for submitting the most appropriate name for PAA's first jet. (The contest-winning name has not been released, nor is PAA obligated to use it.) The same promotion was repeated in England.

Washburn points to dozens of other tie-in promotions—children's coloring books with PAA jet pictures, women's dresses styled for the jet age, Jantzen sports clothes and bathing suits featuring promotions on PAA jets and destinations. A unique gimmick is a "put-together" cardboard flying model of the 707 that folds up into a self-mailer. It will be sold through stores and used by PAA as a giveaway.

PAA advertising (agency is J.

Walter Thompson) started July 14. Only national magazines were used until Sept. 17, when the newspaper campaign started with big ads in 31 cities. In the 56 foreign language papers, ads were aimed at German, Italian, Scandinavian, Portuguese, Polish and Belgian audiences.

With one exception—a Miami weather show—television is limited to the network "Meet the Press" program. Very little radio is used. Other items in PAA's program include big posters in New York subways, vari-view counter-cards, two movies, and a big "traveling" display.

• **AA makes its move**—American Airlines' newspaper ads (Lennen & Newell agency) broke Sept. 7 in New York, Los Angeles, San Francisco and Chicago, first cities to receive service (AA inaugurates 707 service Jan. 11, New York-Los Angeles). Ads with "The Jets Are Coming" theme run every other week through Dec. 7. The following week, the campaign will shift into high gear with ads emphasizing speed and flying time. They will run in New York and California metropolitan and suburban dailies plus papers in important "feeder" cities.

AA's double-page four-color national magazine ads started Oct. 4 in six publications, and run monthly for four months. It is estimated that 70 million readers will see each ad. Sunday supplements and travel trade publications are also being used.

Advertising copy points out that the Boeing "will cut existing flying time almost in half, thus creating extra useful time for business and pleasure . . . tranquil altitudes far above the weather . . . engine noise and vibration have all but disappeared . . . most tested airplane ever to enter airline service . . ."

Spot radio commercials will be broadcast, and AA's "Music 'Til Dawn" radio program will be devoted entirely to the jets. Television is not being used, principally because of the expense involved.

• **Jets underground**—The New York subway system will carry 1,000 jet station posters and 6,700 jet car cards. Los Angeles and suburbs will be blanketed with 24-sheet posters in 396 locations plus painted bulletin boards, all carrying the jet story.

Besides the advertising schedule, AA advertising manager Henry O'Neil points out that the company has an extensive direct mail and display program, the largest single promotional campaign it has ever undertaken. Mailings of booklets, folders and broadsides will go to about one million people. Big displays are ready for AA offices, travel agencies and stores.

Murray Barnes, Pan Am's system advertising director, says that initially PAA considered it was most important to aim at existing air travelers. By getting them to ride the jets, PAA figures to make "salesmen" out of them.

PAA ads feature a big in-flight picture of the 707. "Fastest by Far to Europe" and "6½ Magic Hours" are themes used. Copy mentions "the most thoroughly flight-tested aircraft ever to enter commercial service . . . barely any sensation of speed, none of height, and you fly in near silent vibration-free comfort."

• **Action abroad**—The overseas campaign, being handled by PAA's Atlantic Division under advertising manager Don Dougherty, is also an eye-opener. It too is aimed at the existing market, but the approach is more to the businessman, who does most of the traveling to the U.S.

This overseas effort can best be summed up by noting that the Atlantic Division is buying 63,527,610 circulation in newspapers and magazines, and that there will be 11 exposures to that circulation.

To its mailing lists, AD sent (in four languages) an impressive oversized radiogram, 22 inches by 34 inches, proclaiming that jet service would start this fall. Another was sent on the first day of service. The message on 430 billboards was also changed the same day. In September, a three-page ad ran in 80 magazines. Later this ad was made into a self-mailer promotion piece in 22 languages. Ads in 219 newspapers are either half page or full page. In Europe, some radio spots are used, but no television.

The direct-mail campaign includes a series of booklets and pamphlets, in four languages, that extol the 707 from every angle. One is entitled "A Pilot Speaks" (and says "I'm proud to be a Clipper Captain chosen to pilot the . . . Jet Clipper"). Another features the stewardess and steward viewpoint. A third stresses maintenance and engineering and explains the jet engine.



New York to Paris 7:00

Seattle to Tokyo 9:50

Los Angeles to New York 4:30

Honolulu to Los Angeles 4:50

Anchorage to Stockholm 8:00

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Introduction of the 707 will, in effect, make the world forty percent smaller.

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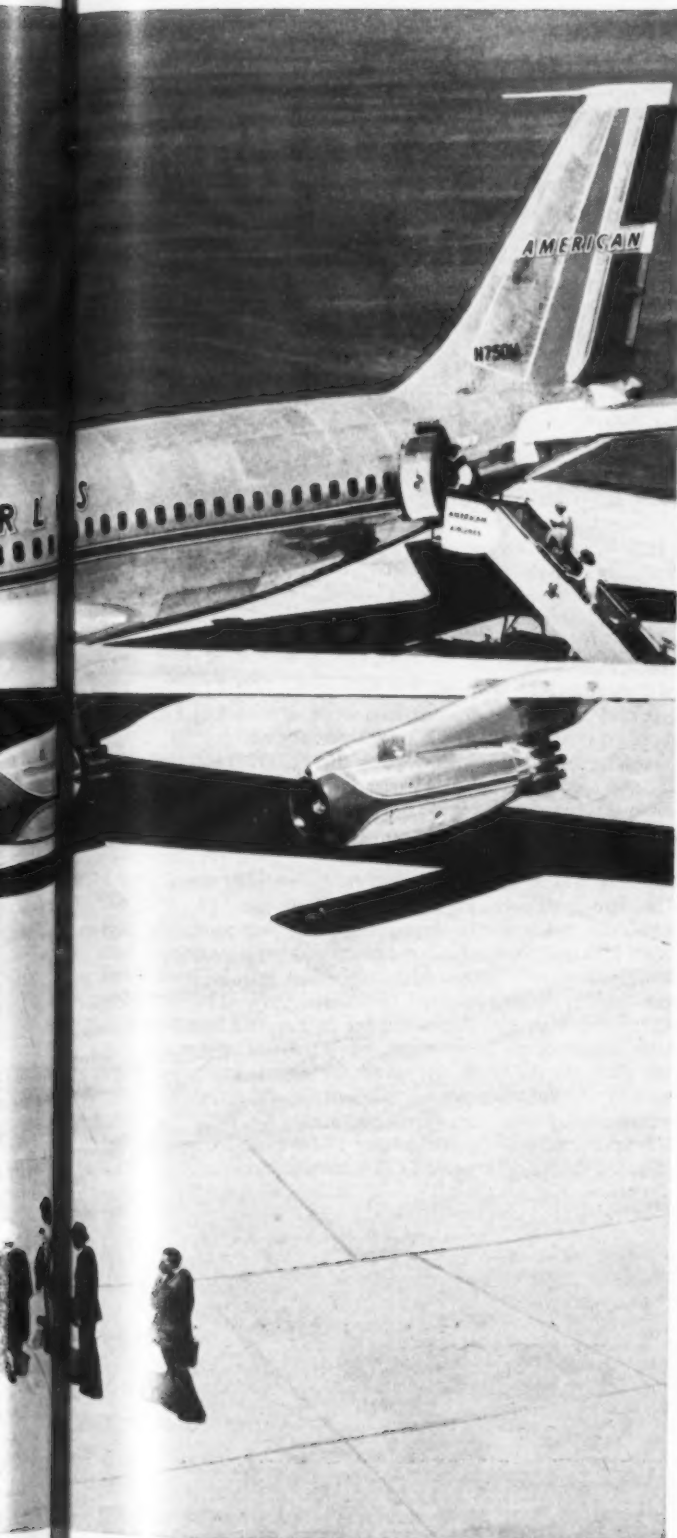
8044 WOODLEY, VAN NUYS, CALIFORNIA

4½ hours coast-to-coast on A

The first jet service in the U.S.A. starts in January



on American's Jet Flagships!



American invites you to enjoy a new and wonderful experience

In January, American Airlines inaugurates the first jet service nonstop in both directions between New York and Los Angeles. Soon after, American will extend its jet service to Chicago, San Francisco, Dallas, Washington, Baltimore, Boston and other major cities.

Now for the first time, getting there becomes a real pleasure

Because the introduction of American's Jet Flagships will cut existing flying times by as much as *forty percent*, you will reap the benefits of extra *useful* time for both business and pleasure.

But speed is not the only remarkable advantage of jet flight. The 707 Jet Flagship cruises at serene altitudes well above turbulence, giving you the *smoothest* flight of your life. And inside the plane itself, the *quiet* adds to your relaxation. For engine noise and vibration, the two factors that contribute most to travel fatigue, have all but vanished. Minutes after you're airborne, you'll discover that jet flight is completely *restful*!

Your first step inside American's Jet Flagship is all it takes to see what luxury is in store for you. The cabin is longer, wider, more elegant than any plane you've ever been in. The reclining seats are deeper, softer and there's more space between them. Comfortable air-conditioning works on the ground as well as in the air. There are a host of other innovations for your comfort and pleasure.

Be one of the first to take advantage of the countless opportunities of jet travel, the sheer delight of jet flight. Starting in January, let American prove to you that *getting there* has become a *real pleasure*.

The Boeing 707 Jet Flagship is the most tested airplane ever to enter service

The prototype of the 707 made its initial flight in July, 1954. It has been flown continuously ever since undergoing four years of the most thorough testing ever given any commercial airliner.

AMERICAN AIRLINES

First with Jets in the U.S.A.

Pratt & Whitney Jets Supply the Push

707-020 and 707-120 will be driven by JT3s—civilian version of J57; JT4 will power 707-220s and 707-320s

The Pratt & Whitney JT3 turbojet engines which power the Boeing 720 (or 707-020) and the 707-120 are the product of some seven years and three million hours of operation as the military J57.

Installed in Boeing B-52 bombers and KC-135 tanker-transport, the engine's overhaul life has been set at 1,400 hours. And when one considers that, last year, 45 B-52s at Westover AFB completed 200,000 flight hours without sending an engine off the base for overhaul, it is apparent that its reputation for reliability was a major talking point leading to its selection for installation in the big commercial transport.

Allowing for spare engines, it's estimated that some 550 JT3s have been sold for installation in the 707. Price is said to run around \$150,000 to \$160,000 per engine.

Basic construction of the JT3 is the same for all models. It's a twin-spool, axial flow turbojet engine with a basic diameter of less than 39 ins. Its nine-stage, low pressure compressor is driven by a two-stage turbine, and pumps air into the seven-stage high pressure compressor which is driven by a single-stage turbine. The two rotor systems are mechanically independent of one another, and engine rpm is governed through the high pressure compressor by a Hamilton Standard hydromechanical fuel control.

The engine's split-compressor design results in a high capacity, high pressure ratio (12:1 plus) compressor which makes the JT3 a powerful, yet relatively very economical, jet engine. Compressor blades are made of a Pratt & Whitney metal known as Wastaloy, and turbine blades are of cast 5382

nickel alloy. No titanium is used in the commercial engine.

The JT3C-6 engine currently in production and powering the 707-120 has a sea level static thrust capability of 13,000 lbs. on takeoff with water injection. Dry takeoff thrust is given as 11,200 lbs. Normal rated thrust, the maximum power approved for a normal climb, is 9,500 lbs., and maximum cruise thrust is 8,100 lbs. at sea level. At this latter power setting, specific fuel consumption is only 0.765 lbs./hr/lb. thrust. Engine weight is 4,234 lbs.

The JT3C-7, scheduled to go into production in Sept. 1959 for installation in the 707-020, will not use water injection for takeoff but is rated at 12,000 lbs. thrust for dry takeoff. Normal rated thrust is 10,000 lbs. and maximum cruise thrust is 8,500 lbs. The engine is considerably lighter than the JT3C-6, weighing in at 3,495 lbs.

This lightening of the engine originally was to be applied only to commercial engine installations, it being felt that, unlike military aircraft, commercial transports would not be flung around in a manner which would apply great stress to the engine. This reduced requirement for rigidity resulted in "thinning out the engine." However, it was found that the finished product was more than adequate for military requirements too, so later J57s will incorporate the same modifications.

When the airlines were deciding what they wanted to get out of the 707, it became apparent that, in many cases, a more powerful engine than the JT3 would be required. Pratt & Whitney's JT4, non-afterburning commercial version of the military J75 fitted the picture nicely, and it's estimated the com-

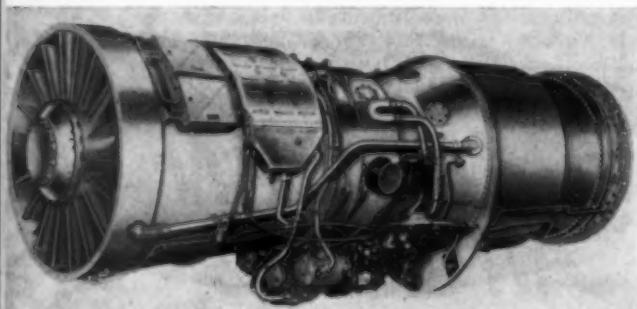


DUCKS AND DEBRIS of all sorts were ingested by jets to pass CAA tests.

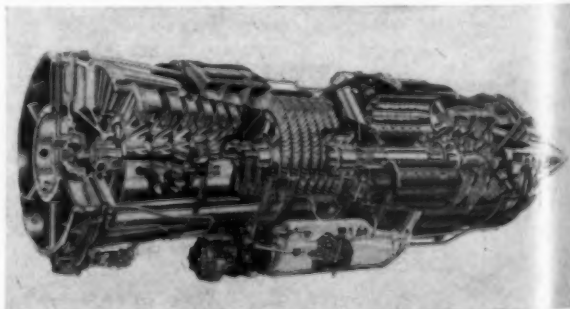
pany has sold some 600 JT4s for 707 installations alone at a cost of \$220,000 to \$240,000 per engine.

Slated for the 707-220 and the -320, the JT4, whose thrust one airline has given as 15,800 lbs., will be flying at Boeing in the next two or three months. All details of this engine remain classified; however, it's nothing more than a king-size version of the JT3. It is not equipped for water injection, and this was a major consideration when Eastern Air Lines specified installation of this engine in all its 707s. The company did not want to become involved with problems of purifying water, storing it, etc. And the engine provides ample power without it, at any rate for Eastern's routes.

Both the JT3C-6 and the JT4 received CAA certification early in 1957.

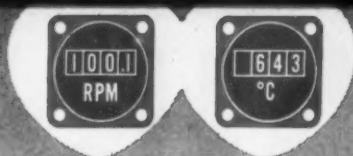


P&W'S JT4 is the most powerful engine ever CAA certified.



CAA SET initial overhaul life of P&W's JT3C-6 at 1,000 hrs.

Pratt & Whitney Photos



DOUBLE DIAGNOSIS TO PREVENT "HEART DISEASE"

...BY THE B&H

JETCAL[®] ANALYZER

Two of the most important factors that affect jet engine life, efficiency, and safe operation are *Exhaust Gas Temperature (EGT)* and *Engine Speed (RPM)*. Excess heat will reduce "bucket" life as much as 50%, and low EGT materially reduces efficiency and thrust. Any of such conditions will make operation of the aircraft both costly and dangerous. The *JETCAL Analyzer* predetermines accuracy of the EGT and (interrelatedly) Tachometer systems and isolates errors if they exist.

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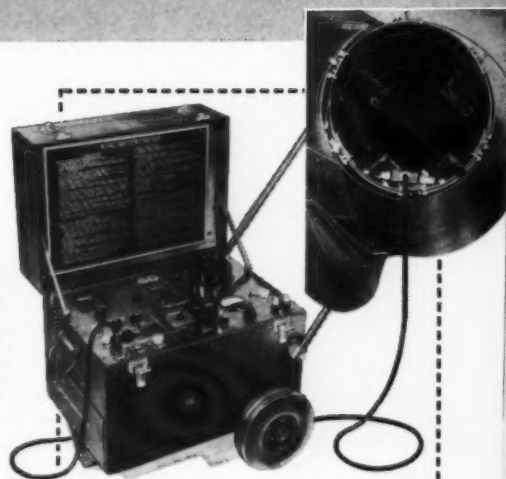
- 1) The *JETCAL Analyzer* functionally tests EGT thermocouple circuit of a jet aircraft or pilotless aircraft missile for error without running the engine or disconnecting any wiring. GUARANTEED ACCURACY is $\pm 4^{\circ}\text{C}$. at engine test temperature.
- 2) Checks individual thermocouples "on the bench" before placement in parallel harness.
- 3) Checks thermocouples within the harness for continuity.
- 4) Checks thermocouples and paralleling harness for accuracy.
- 5) Checks resistance of the Exhaust Gas Temperature system.
- 6) Checks insulation of the EGT circuit for shorts to ground and for shorts between leads.
- 7) Checks EGT Indicators (in or out of the aircraft).
- 8) Checks EGT system with engine removed

from aircraft (in production line or overhaul shop).

- 9) Reads jet engine speed while the engine is running with a guaranteed accuracy of $\pm 0.1\%$ in the range of 0-110% RPM. Additionally, the TAKAL circuit can be used to trouble shoot and isolate errors in the aircraft tachometer system.

- 10) *JETCAL Analyzer* enables engine adjustment to proper relationship between engine temperature and engine RPM for maximum thrust and efficiency during engine run (Tabbing or Mic'ing).

ALSO functionally checks aircraft Over-Heat Detectors and Wing Anti-Ice Systems (thermal switch and continuous wire) by using TEMPAL Probes. Rapid heat rise . . . 3 minutes to 800°F ! Fast cycling time of thermal switches . . . 4 to 5 complete cycles per minute for bench checking in production.



Tests EGT System Accuracy to
 $\pm 4^{\circ}\text{C}$ at Test Temperature

(functionally, without running the engine)

Tests RPM Accuracy to 10 RPM
in 10,000 RPM ($\pm 0.1\%$)

The *JETCAL* is in worldwide use . . . by the U. S. Navy and Air Force as well as by major aircraft and engine manufacturers. Write, wire or phone for complete information.

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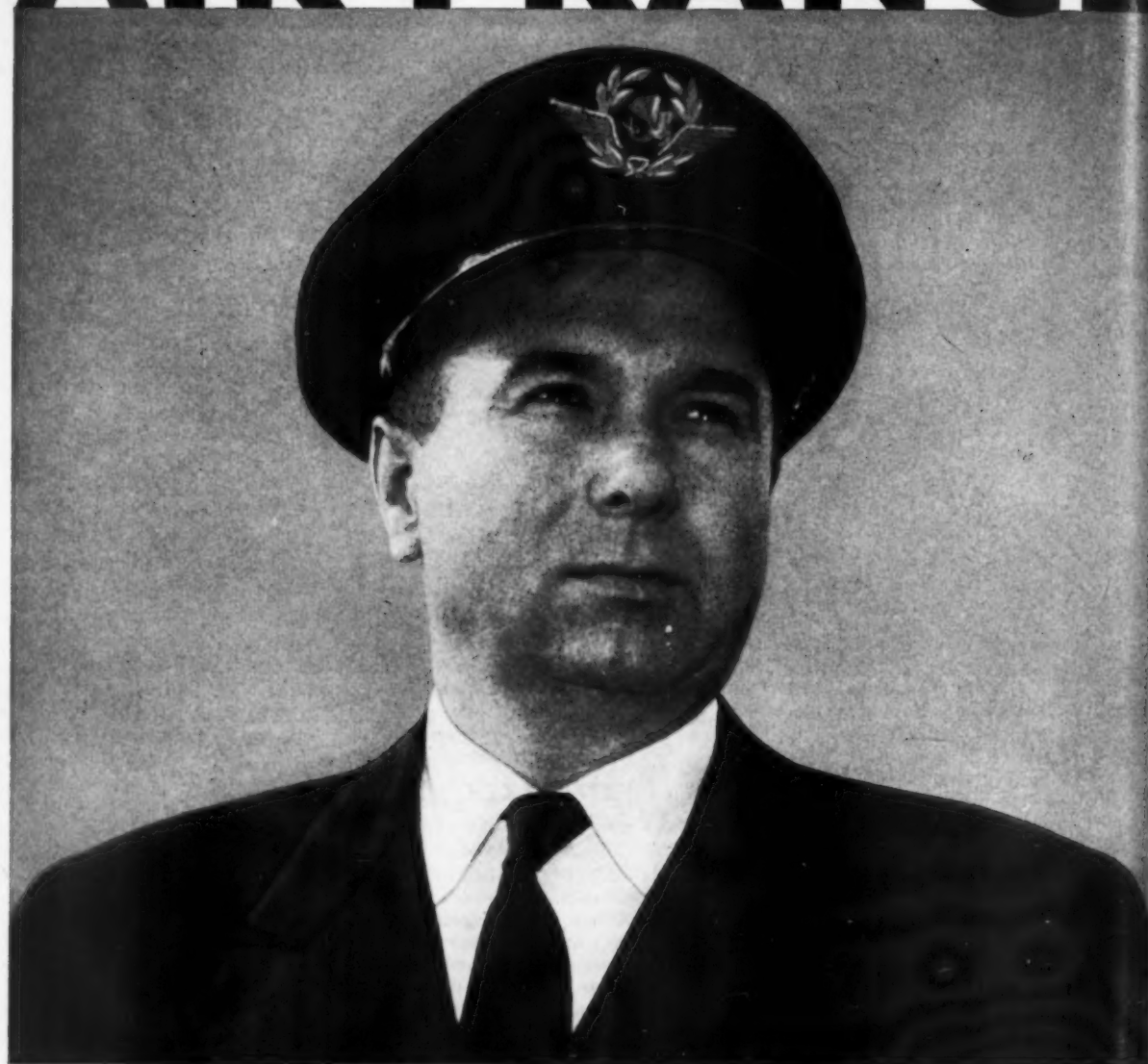
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WORLD'S LARGEST AIRLINE/WORLD'S MOST PERSONAL SERVICE

—707 POWERPLANTS— The Conway: Power for 420s

By Anthony Vandyk
International Editor

The version of the Rolls-Royce Conway by-pass engine to be used in the Boeing 707-420 is the R.Co.10 or Mark 505 developing initially 16,500 lbs. thrust. Thrust of the engine will be increased to 17,500 lbs. later by recalibrating the fuel system after service experience has been built up. The 17,500-lb. thrust civil Conway will be designated R.Co.12. Subsequently the R.Co.15 with a guaranteed minimum thrust of 18,500 lbs. will be available to airline operators. Military Conways of 17,250 lbs. thrust are currently in production for the Handley Page Victor 2 bomber.

Four airlines have specified the Conway for their Boeing 707-420s: BOAC, Lufthansa, Air-India International and Varig. BOAC has also ordered the engine for its Vickers VC-10 fleet while Trans-Canada Air Lines and Alitalia will use it in their Douglas DC-8s.

Why have these airlines chosen the Conway?

The first reason is that they have been impressed by Rolls-Royce's arguments that the by-pass engine has better fuel consumption yet is considerably lighter and quieter than the straight turbojet of equivalent power. Moreover the by-pass is no larger in diameter than its straight turbojet counterpart.

The second reason is that the Conway is offered at a lower price than the P&W JT4.

And the third reason that airlines have bought the Conway is the "magic" of the Rolls-Royce name.

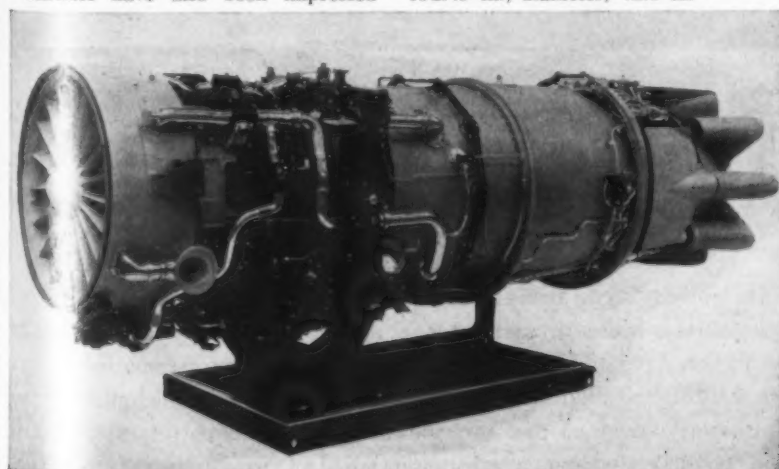
Airlines have also been impressed

by Rolls-Royce's work on silencing and thrust reversal. The company's thrust reverser as fitted to the Conway in the Boeing 707-420 develops as much as 50% of the maximum thrust in reverse. The Rolls-Royce corrugated-type silencing nozzles are used in the 707-420 although the Conway already gives 10 decibels less noise than an equivalent straight turbojet.

How does the Conway work? Basically it is a twin-spool twin-shaft engine in which the high-pressure compressor is driven by the high-pressure turbine, and the low-pressure compressor is driven by a shaft running inside the high-pressure shaft and connected to the low-pressure turbine. The two spools operate independently of one another and adjust themselves to different conditions of flight. The low-pressure compressor is oversize and excess air is taken through the by-pass duct past the high-pressure compressor and combustion section to join the main gas stream in the jet pipe aft of the turbine. This arrangement gives a slower, cooler jet efflux and greater propulsive efficiency.

Because of the slower jet pipe velocity, there is a reduction in jet noise, and because of the cool envelope of by-pass air surrounding the "hot" parts of the engine, the skin temperature of the engine is only about 200°F. Therefore the engine does not require elaborate heat shields, which gives a reduction in installed weight, and does not require cooling air which would give increased drag.

The Conway is still under security wraps and only the following dimensional data may be published: Length, 132.45 in.; diameter, 42.0 in.



Rolls-Royce Ltd. Photo

THE ROLLS-ROYCE CONWAY 505 for the Boeing 707-420 here is fitted with its thrust reverser and silencing nozzles.

READY NOW

1. STANDARD SECTION
2. DC-3 SECTION
3. DC-4 SECTION

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Spares, Replacement Parts and Overhaul Manual

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- Deck height 10', working height up to 18'.
- 110-gal. tank, 2 cyl. piston pump.
- 23½ hp, 4-cycle gasoline engine.



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For further information, write for Brochure A-5200-ES.

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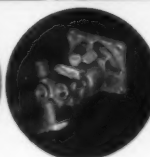
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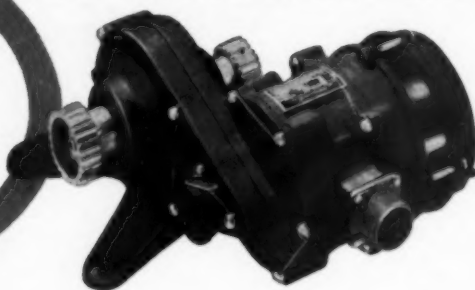
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**AIRBORNE
LARGE SPECIAL
ACTUATOR SOLVES
EMERGENCY FLAP DRIVE
REQUIREMENTS ON
BOEING 707**

Emergency flap drive on Boeing 707 Stratoliner is provided by Airborne Model R1624-1 special-design rotary actuators. Units are permanently coupled to flap linkage, provide electro mechanical drive in event of hydraulic failure. Output shafts are driven whenever hydraulic system operates, but because of special inertial clutch, rotors do not turn unless energized.



Specifications: Motor: 200/115 v a-c, 400 cycles, 3-phase, reversible. Speed at rated torque (450 in-lb): 85 rpm \pm 10 rpm. Duty cycle 3 min. on, 27 min. off. Operating range: 102-124 v (line to neutral); 380-420 cps; -65 to +160°F; 0-50,000 ft. Weight 12 lbs.

In addition to offering an extensive line of modular-type electromechanical actuators, Airborne can also meet your requirements for large special designs—linear or rotary. Typical of these special Airborne actuators is Model R1624-1, used on Boeing's new 707 Stratoliner to operate the flaps in the event hydraulic power is lost. At the right are some of the more difficult engineering problems that were presented by this specialized application, along with Airborne's solutions to them.

PROBLEM

Rotor to be disconnected from output gear stages except when motor is energized in either direction.

Starting torque to be 800 in-lb minimum, with pullout torque of 900 in-lb (\pm 100 in-lb) at 50% motor slip (\pm 10%) under all voltage, frequency and environmental conditions.

In event of a jam in actuator transmission or rotor, unit to be fail-safe by permitting rotation of output shaft by torque of 1000-1300 in-lb. Once started, rotation to be maintained by torque not exceeding 100 in-lb.

Contact us for recommendations on your special actuator requirements . . . or for information on Airborne's standard line of modular design actuators.

SOLUTION

Inertial clutch—consisting of small weights in a cage—incorporated between motor and gear train. Makes positive contact with intermediate drive gear only when rotor shaft turns.

Special lightweight motor developed by Airborne to meet these exacting requirements. Rated .9 hp at 10,300 rpm, drawing 2.5 amp maximum.

Special ball-detent, torque-limiting clutch incorporated on output shaft.

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AIRBORNE ACCESSORIES CORPORATION

HILLSIDE 5, NEW JERSEY

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The New Jets Will Mean New Methods

The Boeing 707, superficially just a great big transport with swept wings and a new kind of engine, is invading the technical areas of airline operation as far more than just that. It is a new breed of airplane.

Whether pilot, engineer or mechanic, the airline technician faces in the jet a challenge of unprecedented proportions—presumably with somewhat mixed emotions. In one fell swoop, the 707 and the jets that will follow invade the airline operating scene as vehicles of new-found safety through simplicity, but demanding new levels of precision both in their operation and maintenance.

The Boeing 707 jet is the biggest, sturdiest, fastest and most expensive item of equipment yet to be entered on an airline inventory ledger. Its Pratt & Whitney or Rolls-Royce jet engines represent a breakthrough in simplification from the complexities of 18-cylinder turbocompounded and 28-cylinder turbosupercharged piston types.

Its cockpits will reflect this simplicity with fewer instruments, the absence of propeller controls, ignition analyzers and a host of piston engine and prop additives.

In the extremes of disillusion, one might be convinced that the years of headache and hard work in airline operation and maintenance are over. The true situation couldn't be more to the contrary.

To the pilot, jet takeoff decisions become split-second, not an easy chore despite cockpit simplification. Lagging development of better, more readable airspeed and altimeter instrumentation complicates his problem.

Inaccurate fuel management with the kerosene-thirsty jets can skyrocket the cost of any given flight, force a change in flight plan if too far off the mark.

For the engineer and mechanic, jet fuel handling becomes a matter of hospital-like cleanliness; engine foreign object damage magnifies from a piston engine nuisance item to a major jet threat; unfamiliar a-c electrical systems make their debut; the number of wheels and tires doubles; ultra-sensitive jet fuel controls displace the carburetor.

In short, the jet transport is new and fast and airline pilots, engineers and mechanics will have to learn fast to meet its challenge. Here's what they can look to in the structures and systems of the Boeing 707:

• **Structure**—Podded engines for the

first time in airline history bring the mechanic out of the caverns of the wheel well, providing an accessibility never before available for maintenance.

With the exception of the more recent addition of leading-edge wing flaps, the structural breakdown of the Boeing jets has shown little change during its development. Major departures from the conventional are the multiplicity of small (9" x 12½") cabin windows, a sharp increase in the number of individual flight controls (high and low-speed ailerons, slotted wing flaps, fillet flaps and spoilers) and variable horizontal stabilizers.

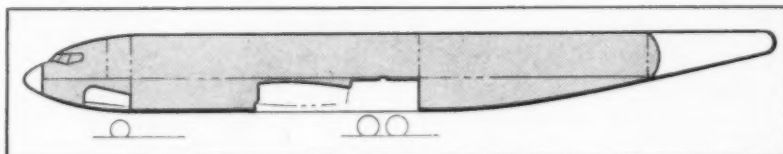
General structure is conventional 2024, 7075 and 7168 aluminum alloy. Steel, stainless steel, magnesium and titanium alloys are used in specialized areas, the latter, for example, in the engine firewall. Bonded metal honeycomb makes its appearance in airline equipment via the fabrication of control surface tabs.

• **Air conditioning and pressurization**—Cabin cooling relies upon an air-cycle system, developed for Boeing by AiResearch Manufacturing Co., supplying about 3,200 cfm airflow to the huge 707 cabin.

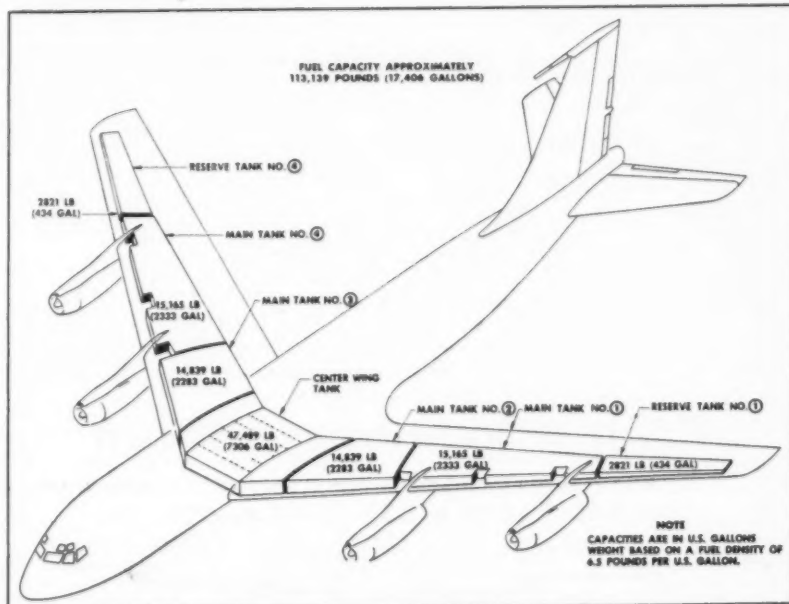
A Freon vapor-cycle refrigeration system by the same manufacturer also is available at the request of the customer.

Cabin differential pressure of 8.6 psi, supplied by an AiResearch compressor driven by engine compressor bleed air, is capable of maintaining a "sea level" cabin up to 22,500 ft., takes the 707 passenger up to 40,000 ft. in a 7,000 ft. cabin. In all, the total pressurized volume is about 13,078 cu. ft. and excludes only the wheel wells, center-wing section, radome and tail compartments.

Cabin heating is furnished by three AiResearch turbocompressors and is regulated by a United Control Corp. temperature control system. Wing anti-



PRESSURIZED SECTIONS of 707 are shown shaded.



FUEL TANK LAYOUT in the Boeing 707-120 with fuel capacity in pounds and gallons based on weight of 6.5 lbs. per gallon. Capacity is 113,139 lbs. (17,406 gals.) but ranges up to 153,270 lbs. (23,580 gals.) for the 707-320.



ignition



Boeing 707 JETLINER

Powered by

Pratt & Whitney Aircraft

GENERAL LABORATORY ASSOCIATES, INC.

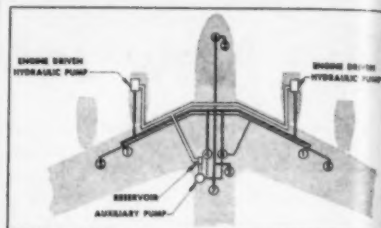
Norwich (GLA) New York

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Boeing 707 Issue

—707 TECHNICAL DETAILS—



707 HYDRAULIC SYSTEM stresses simplicity. Major components are: (1) inboard spoilers; (2) flap actuation systems; (3) nose gear steering; (4) brakes; (5) outboard spoilers; (6) nose gear actuation; (7) main gear actuation; (8) auxiliary selector valve.

icing is the thermal type with air supplied from the front (low pressure) engine compressor, whereas the engine nose cowl and inlet guide vanes are anti-iced from the aft (high pressure) compressor. For horizontal stabilizer and fin ice protection, Boeing skirts the problem of complex ducting, plumbing or tail heaters by use of electrical de-icing with Goodyear boots operated from the aircraft's 400 cycle a-c power.

• **Electrical system**—Probably the most significant system departure from conventional transport practice is the 707's 115/200 volt, three-phase, 400 cycle a-c electrical system supplied by four Westinghouse 40 kva generators. The generators are regulated by Sundstrand Aviation constant-speed drives; system circuit breakers are Jack & Heintz.

Transformer rectifiers for the 28 volt d-c system provided to supply electronic gear are furnished by General Electric and Chatham Electrical Corp. and are located in the electrical equipment rack accessible to the flight engineer in flight.

The 707 retains conventional Exide lead-acid batteries although presumably will be adapted to use of newer nickel-cadmium types being introduced on other jets.

• **Hydraulic system**—In hydraulics, the jet has prompted most airlines into their first clean break with older flammable hydraulic fluids and a shift to Monsanto's Skydrol 500 fire-resistant fluid. The result should be a major advance in fire safety in the \$5-million jets, although airline mechanics still faced with use of mineral oil fluids in piston transports will have to be alert to avoid the jelly-like mixture that comes of marrying the two fluids in the 707's big hydraulic system.

The basic hydraulic system is a most straightforward 3,000 psi design using two engine-driven Vickers, Inc. 22

AMERICAN AVIATION



15 PUROLATOR FILTERS FLY WITH EVERY BOEING 707

Effective filtration is essential on the 707 just as it has been on all aircraft for the past 25 years. Fifteen Purolator Micronic filters ensure that fluids move freely, and give optimum performance, by filtering out sub-micronic particles of foreign matter . . . particles that could cause serious trouble in a jet transport going 600 miles an hour.

With filtration such a must in any aircraft built today . . . or planned for tomorrow . . . there's no reason to settle for anything less than Purolator.

For every vital fluid used in aircraft . . . fuels, lubricants, hydraulic fluids and air . . . nothing performs better than a standard Purolator filter. The same will hold true when new needs arise. All fluids need filtration. And none need get along without the extra margin of reliability of Purolator filtration.

Filtration for Every Known Fluid

PUROLATOR
PRODUCTS, INC.

RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA



Is it possible to build a **MAN**?

"Theoretically, yes," said the scientist. "Or a reasonably remarkable imitation—a kind of mechanical analogue. Call it a habit machine, a mechanism operating according to the laws of the conditioned reflex."

You mean that you could actually build a mechanical mind? One that would exhibit emotions—such as love, fear, anger, loyalty?

"We're doing something like that now in advanced missile development," the scientist replied. "In a limited, highly specialized way, of course."

"Take the 'pilot' that is being developed for the big long-range missile. *He* has a wonderful memory, and can solve many complex navigational problems in a flash. *He* loves perfection, and actually becomes highly excited when *he* gets off course. *He's* a tough-skinned character, impervious to the cold at several hundred miles altitude and the incredible heat at re-entry. And *his* loyalty is heroic. *His* life is a single mission, the mission *his* whole life...and maybe ours, too. *He's* a pretty important fellow."

What about the complete man-made Man? What would that entail?

"A mechanism the size of the capitol in Washington, and the best scientific resources in the world. But it could be done. You see, it's only a question of how physical matter is organized. As a great biophysicist explained, 'If material is organized in a certain way, it will walk like a man. If it is organized in another way, it will fly like a missile.'"

Still, wouldn't there be something missing in the complete man-made Man—something very important?

"Yes," said the scientist. "A soul."

MARTIN
BALTIMORE · DENVER · ORLANDO

—707 TECHNICAL DETAILS—

gpm pumps for the main system and a single 3 gpm New York Air Brake electrically-driven pump for the auxiliary system. A 25 cu. in. Sprague Engineering accumulator stores system pressure and a 7-gal. reservoir handles the fluid supply.

The main system powers the landing gear extension and retraction, the inboard spoilers, flap drive system, nose wheel steering and wheel brakes. The auxiliary system, which has its own 1.25 gal. reservoir and 25 cu. in. accumulator, supplies power to the outboard spoilers and is an alternate source for brake operation.

In addition to hydraulic power, the 707's flap system has a standby electrical motor for emergency operation. There are two independent flap drive systems, one for inboard and fillet flaps, the other for outboard flaps. The flaps are actuated by Beaver Precision Products' ball bearing screw actuators, patterned after a design already proven by Boeing in such aircraft as the B-47, B-52 and KC-135.

• **Fuel system**—The 707's fuel system, although tailored to the needs of its kerosene-consuming jet engines, also is a very straightforward design despite the tremendous increase in fuel consumption over piston transport standards. In the 707-120 where gallonage figures run to about 17,406, Boeing has confined the system to as few as seven tanks. This compares with as many as 10 in some of today's piston aircraft carrying much less fuel.

The fuel system uses four main engine pumps plus two 400-cycle a-c Thompson 16 psi max. booster pumps in each main and center wing tank. Use of a-c pumps, Boeing feels, adds a new element of reliability to aircraft fuel systems in that the prime causes of d-c pump failures of the past, ro-



WING FLAP ball screw actuator for 707 shown in cutaway.

tating shaft seals and brushes, are eliminated.

• **Other systems**—Fuel dumping provisions include two chutes, one for the left wing tanks and the other for the right wing and center wing tanks. Chutes are electrically released but aerodynamically actuated and once extended are not retractable in flight.

The dumping itself is by gravity flow with standpipes to reserve about 15,000 lbs. of fuel for engine operation. The righthand and lefthand systems are parallel and so arranged that, should one fail, most of the fuel aboard can

be dumped without creating asymmetrical flight loads.

The 707 landing gear, made up of two four-wheel main gears and a dual nose wheel, comprises Boeing-designed actuating cylinders, Cleveland Pneumatic shock struts, Bendix wheels and brakes and the Hydro-Aire Hytrol anti-skid system. Eight main gear wheels use 46 x 14 tires and the dual nose wheels, 39 x 13 tires.

Fire detection system is by Walter Kidde & Co., Inc. or Fenwal, Inc. at customer's option. Fire detection is the continuous cable type and protects the engine and cargo/accessory com-

partments. Kidde fire extinguisher system uses bromotrifluoromethane with two 2.5-lb. or, in some cases, two 4.5-lb. cylinders mounted at each inboard engine pod strut.

The 707 oxygen system, the gaseous type, reflects the continued airline disinterest in the ticklish handling problems of liquid oxygen widely used by the military. In the 707, Boeing provides four 1,800-psi Scott Aviation Corp. cylinders. Cabin passenger provisions will include automatic dispensing of masks from overhead cabin service pods in event of an explosive decompression.

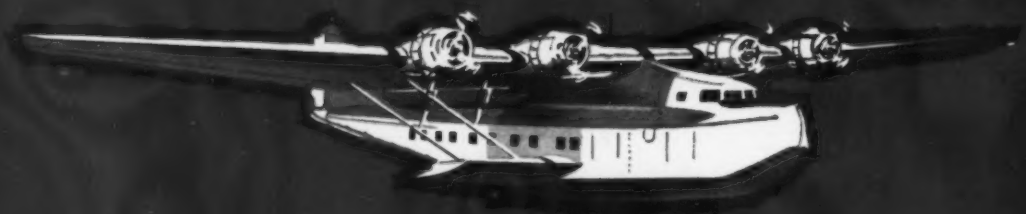
Major Structural Items

Breakdown of the Boeing 707 major structural items includes: (11) stub section; (12) inboard wing; (13) outboard wing; (14 & 15) inboard and outboard leading edges; (17) outer wing trailing edge; (19) wingtip; (30) spoilers; (31-32) inboard and outboard flaps; (33-34) inboard and outboard ailerons; (41) cockpit section; (43) fore and aft fuselage sections; (46) rear fuselage; (48) tail section; (61) main landing gear; (62) nose gear; (71) power packages; (72-74) engine pod struts; (81) variable stabilizer torque box; (82) horizontal stabilizer; (83) stabilizer leading edge; (84) elevators; (85) dorsal fin; (86) vertical fin; (87) fin leading edge; (88) rudder; and, (89) fin tip. New wing leading edge flaps not shown.

Shaded areas are fabricated by Boeing. Other parts are supplied by:

Name of Supplier	Items Supplied	Name of Supplier	Items Supplied
Aerona Mfg. Corp.	Wing Stub	Eclipse Pioneer Div. of Bendix Aviation	Auto Pilot and Flight Instruments
AlResearch Mfg. Co.	Starter System Air-conditioning Equipment	Elastic Stop Nut Corp.	Lightweight Fasteners
Aluminum Co. of America	Aluminum Sheet, Plate Extrusions, Forgings and Castings	The Electric Auto-Lite Co.	Wire and Cable (electrical)
Bridgeport Brass Co.	Extrusions and Forgings	Firestone Tire & Rubber Co.	Fuel Cells
Cannon Electric Co.	Electrical Connectors	B. F. Goodrich Aviation Products	Wheels, Brakes and Tires
Cleveland Pneumatic Tool Co.	Main Landing Gear	Goodyear Tire & Rubber Co.	Tires and Fuel Cells
Hamilton Standard Div. (United Aircraft)	Air-conditioning Equipment, Pneumatic Valves		
Hardman Tool & Engineering Co.	Passenger Seats		
Kaiser Aluminum & Chemical Sales, Inc.	Aluminum Sheet Plate Extrusions Forgings		
Kaynar M. Square Co., Inc.	Lightweight Fasteners		
Kollsman Instrument Corp.	Integrated Flight Instruments		
Longren Aircraft Co. Mechanical Products, Inc.	Inner Spar Ribs Circuit Breakers		
Menasco Manufacturing Co.	Nose Landing Gear		
Minneapolis-Honeywell	Fuel Quantity Measuring Systems		
Monrovia Aviation Corp.	Inboard Ailerons		
Northrop Aircraft Corp.	Body Section Outboard Wing		
Pratt & Whitney Co.	Engines		
Rohr Aircraft Corp.	Body Sections Power Packs Thrust Reverser-Sound Suppressors Horizontal Stabilizers Elevators		
Reynolds Metals Co.	Aluminum Sheet and Plate Extrusions and Tube		
Remington Rand Div. of Sperry Rand Corp.	Electro Mechanical Equipment Engines		
Rolls-Royce	Engines		
Scintilla Div. of Bendix Aviation	Electrical Connectors		
Standard Pressed Steel Co.	High Tensile Close Tolerance Bolts		
Sundstrand Aviation Corp.	Hydraulic Drives		
Twin Coach Co.	Vertical Fin Rudder Spoilers		
United Control Corp.	Electronic Control Units		
Weber Aircraft Corp.	Crew Seats		
Westinghouse Electric Corp.	Electrical Generation System		
Wyman-Gordon Co.	Forgings		

This list is incomplete but includes manufacturers whose contribution to the airplane is important in either dollar volume and/or development and manufacturing techniques.



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liquid polymer base sealants in its wings, fuselage and cabins.

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As the jet age in commercial flight comes closer . . . introduced by great aircraft like the Boeing 707 Stratoliner . . . THIOKOL liquid polymer base sealants help to enlarge man's mastery of time and distance.



TO THE BOEING 707

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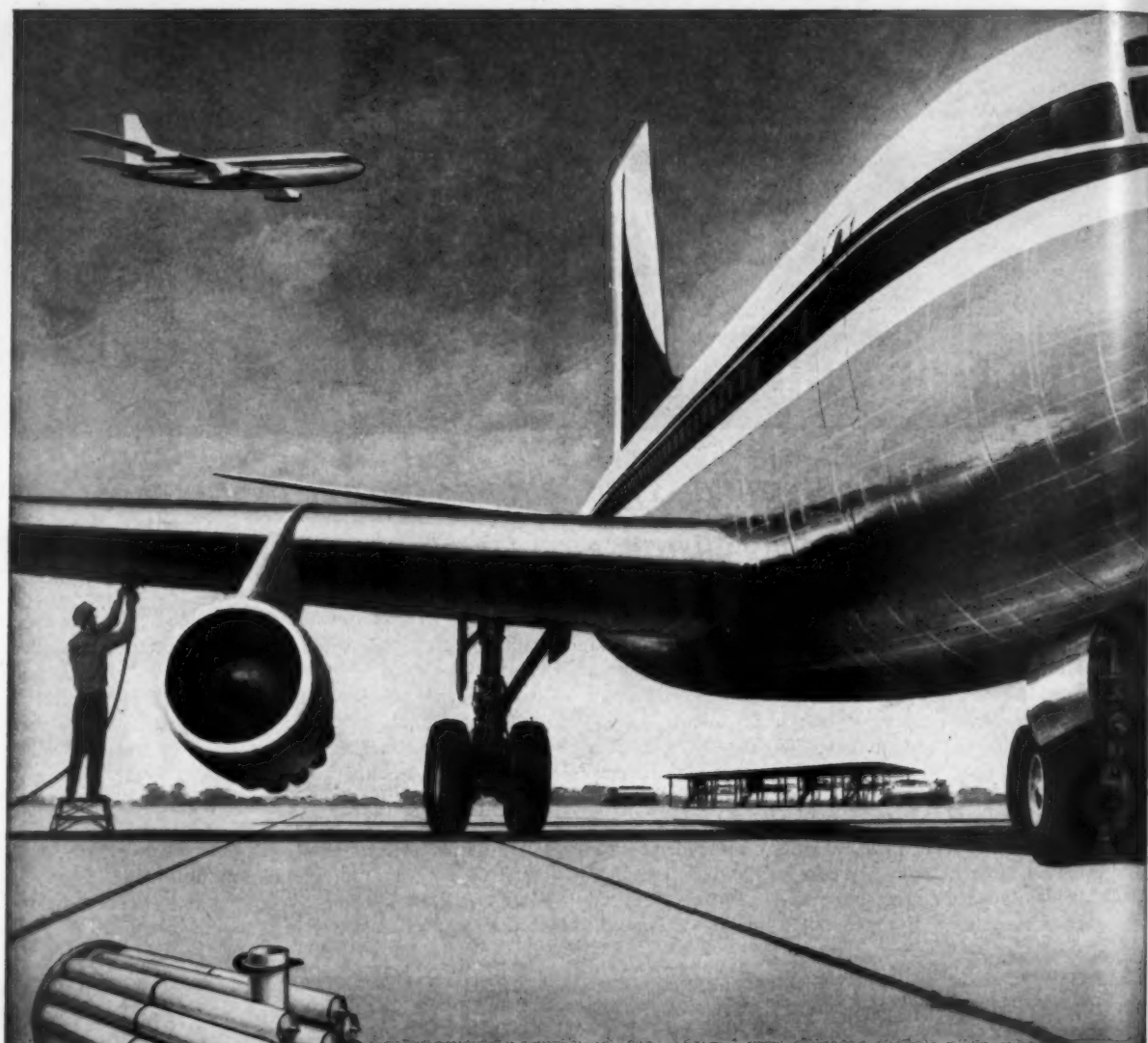
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replacing elements.

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RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA

Circle No. 15 on Reader Service Card.

AMERICAN AVIATION

-707 TECHNICAL DETAILS-

Runway Requirement

How much runway needed under various conditions?

The pilot's flight manual approved by the Civil Aeronautics Administration for the Boeing 707-120 series of jet transports discloses that Pan American World Airways' aircraft will be able to take off from the New York International Airport's 9,422-ft. runway at the following weights:

Standard day, zero wind . . . 238,000 lbs.
Standard day, 15 mph wind . 246,500 lbs.
100 degree day, zero wind . 227,000 lbs.
32 degree day, zero wind . . 244,500 lbs.

These are brake release weights, and are cited to illustrate how they vary under environmental conditions. Maximum gross ramp weight for the 707-120 series is 248,000 lbs. and the maximum brake release weight 246,000 lbs., but these weights (at sea level on a standard day, under zero wind conditions, with zero airport gradient) call for a runway distance of 10,150 ft.

This means PAA will be able to move its 707-120s up to full loads after the runway extension at Idlewild is completed—providing the weather fits into the takeoff profile. If it's a 100-degree day, maximum weight would require 11,400 ft. of runway. The alternative is to reduce the weight to 236,500 lbs.

The 707-120's minimum landing distance for the maximum landing weight of 175,000 lbs. is 6,000 ft. at sea level and thus causes no problem. It can land at any airport where it can take off. Landing climb out weight is the critical weight and the 707-120 can make good its maximum landing weight of 175,000 lbs., at sea level, up to 98° F. A landing weight of 160,000 lbs. at sea level would reduce the runway requirement to 5,700 ft.

Structural weight limits for the 707-120 are:

Ramp weight 248,000 lbs.
In flight with 30 degree flaps . 246,000 lbs.
In flight with flaps up 243,000 lbs.
Landing weight 175,000 lbs.
Zero fuel weight 165,000 lbs.

Actual zero fuel weight, however, is 160,000 lbs. because the amount of undumpable fuel exceeds the 10,000 lbs. difference between the structural zero fuel weight and the landing weight.

Dispatchers will calculate the weight requirements for flights by starting with the 248,000-lb. ramp weight and working backward.

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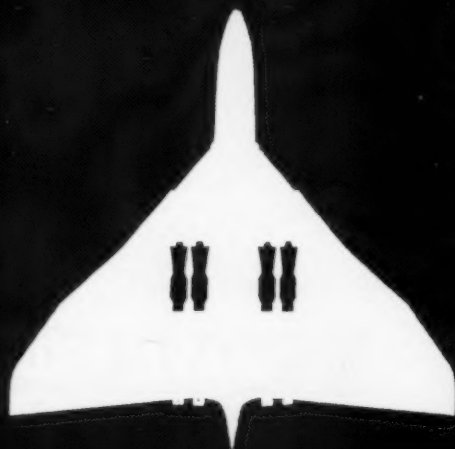
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THE BRISTOL OLYMPUS TURBOJET ENGINE



BRAIN POWER

THE PROBLEM. To engine a projected long-range high-speed bomber (later to crystallise as the Avro Vulcan), a concept steering turbojet development into new realms of high altitude operation and massive thrust.

THE ANSWER. The Bristol Olympus, one of the world's most powerful aero-engines. Olympus progressed from the Mk 101, type tested in 1954 at 11,000-lb thrust, to today's Mk 201, type tested at 17,000-lb thrust. Both these figures were attained *without* reheat and with *good* fuel consumption and impressively high thrust/weight ratios.

Signs of success

To the engineer, the Olympus represents the successful implementation of a theory: it pioneered the twin-spool principle with its promised bonuses of lower fuel consumption at both low and high altitudes, higher power, and rapid acceleration even at extreme altitudes.

In RAF service, however, the Olympus has achieved this and more. Not only as an engine officially complimented for setting new standards of handling at high altitudes but as a "fit and forget" engine; as an engine sharing with the Avro airframe the highest official praise as the aircraft suffering the fewest teething troubles of any introduced into the RAF in ten years.

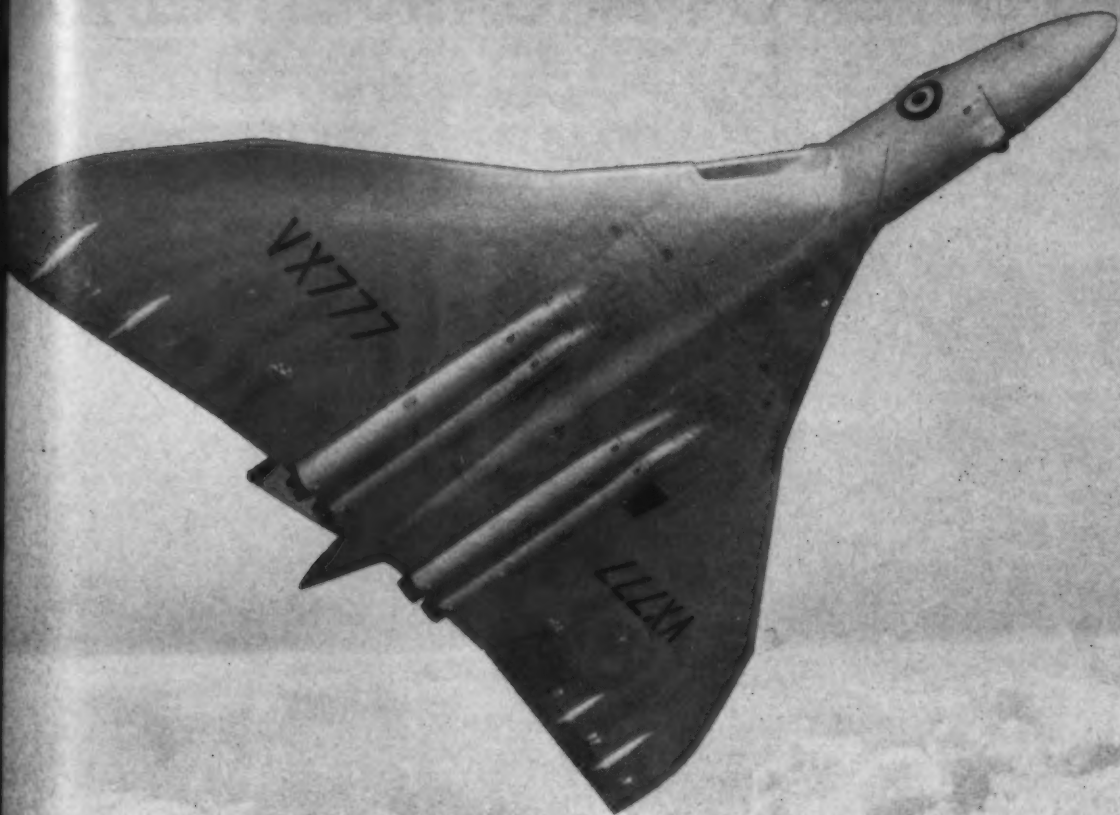
Development of the Olympus continues. The new marks represent just about the ideal design for flight just below and just above the speed of sound.

Versions with reheat are already delivering thrusts up to 24,000 lb.

Other famous Bristol Siddeley engines:

ARMSTRONG SIDDELEY SAPPHIRE—turbojet... high subsonic and supersonic speeds... powerplant of the Handley Page Victor bomber.

BRISTOL PROTEUS—most powerful jet-prop in airline service... remarkable mechanical excellence and exceptional reliability... in the Bristol Britannia.



R FLIGHT POWER

ARMSTRONG SIDDELEY VIPER—turbojet . . . exceptional handling qualities . . . powers the Hunting Jet Provost, RAF's basic jet trainer, and the Jindivik pilotless target aircraft.

BRISTOL ORPHEUS—outstanding lightweight medium-thrust turbojet . . . already specified for 14 different aircraft in 8 countries.

ARMSTRONG SIDDELEY SINGLE MAMBA—jet-prop . . . stressed for naval operations such as deck landing and catapulting . . . installed in the Short Seamew.

BRISTOL THOR—a fully developed ramjet engine . . . powers the Bristol/Ferranti Bloodhound guided missile, Britain's major air defence weapon, ordered by Sweden.

ARMSTRONG SIDDELEY DOUBLE MAMBA—jet-prop . . . virtually twin-engined reliability for long overseas reconnaissance

ance duties . . . powers the Fairey Gannet anti-submarine aircraft.

BRISTOL CENTAURUS AND HERCULES—two radial piston engines, with Bristol-pioneered sleeve-valves . . . renowned for their reliability and long overhaul life.

Bristol Siddeley

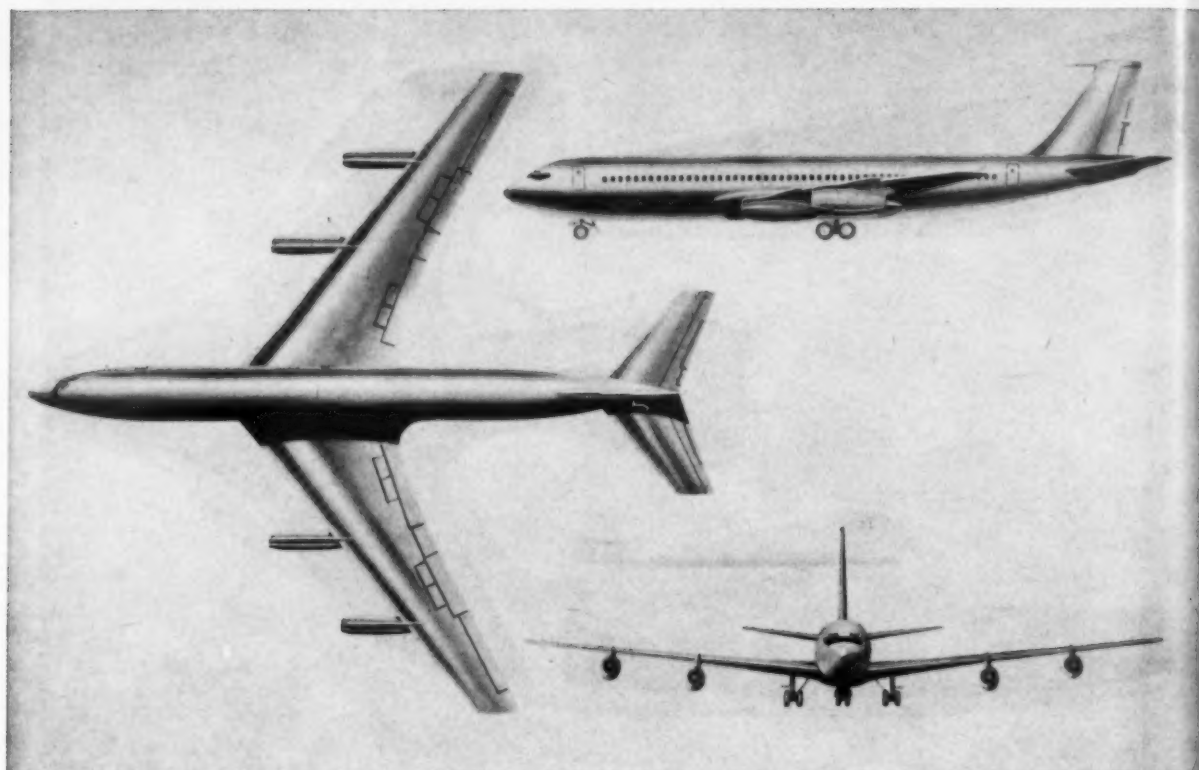
ENGINES LIMITED

BRAIN POWER translated into FLIGHT POWER

NOVEMBER 3, 1958

47

—707 SPECIFICATIONS—



The Form and Figures for the 707s

Model	707-120	707-220	707-320	707-420	720	707-020
Dimensions:	L. overall—134' 6" (short body) or 144' 6" (long body); span—130' 10"; height—38' 7"; tail span—39' 8";	L. overall—144' 6"; span 130' 10"; height—38' 7"; tail span—39' 8";	L. overall—152' 11"; span—142' 5"; height—38' 8"; tail span—45' 8";	L. overall—152' 11"; span—142' 5"; height—38' 8"; tail span—45' 8";	L. overall—134' 6"; span—130' 10"; height—38' 7"; tail span—39' 8";	L. overall—134' 6"; span—130' 10"; height—38' 7"; tail span—39' 8";
Airline Orders:	Pan American—6 (Model 121); American Airlines—25 (Model 123); Continental—4 (Model 124); TWA—15 (Model 131, short version); Qantas—7 (Model 138); Cubana—2 (Model 139); USAF—3 (VC-137A)	Branniff—5 (Model 227)	Pan American—17 (Model 321); Air France—17 (Model 3280); Sabena—5 (Model 329); TWA—18 (Model 331); SAA—3 (Model 344)	Lufthansa—4 (Model 430); Air India—3 (Model 437); BOAC—15 (Model 436); Varig—2 (Model 441)	United—11 plus 19 on option (Model 022)	American—25 (Model 023)
Powerplants:	Four P&W JT3C-4s	Four P&W JT4A-3s	Four P&W JT4A-3s	Four Rolls-Royce Conway Mk. 505s	Four P&W JT3C-7s	Four P&W JT3C-7s
Maximum Rating:	11,000 lbs.*	15,000 lbs.*	15,000 lbs.*	16,000 lbs.*	11,200 lbs.*	11,200 lbs.*
Fuel Capacity:	113,000 lbs.	113,000 lbs.	149,500 lbs.	149,500 lbs.	65,600 lbs. (normal) 87,600 lbs. (max.)	65,600 lbs. (normal) 87,600 lbs. (max.)
Weights						
Empty:	113,640 lbs.	117,500 lbs.	131,000 lbs.	129,900 lbs.	103,145 lbs.	103,145 lbs.
Payload:	40,700 lbs. plus	40,000 lbs.	40,000 lbs.	40,000 lbs.	33,000 lbs.	33,000 lbs.
Gross:	245,000 lbs. plus	245,000 lbs. plus	295,000 lbs. plus	295,000 lbs. plus	203,000 lbs.	203,000 lbs.
Performance						
Cruise speed:	591 mph	605 mph	605 mph	585 mph	600 mph plus	600 mph plus
Cruise altitude:	25,000 to 40,000 ft.	25,000 to 40,000 ft.	25,000 to 40,000 ft.		15,000 to 40,000 ft.	15,000 to 40,000 ft.
C.A.R. takeoff field length over 50 ft. obstacle with full passenger payload:	9,300 ft.†	6,800 ft.†	8,900 ft.†	9,200 ft.†	6,500 ft.†	6,500 ft.†
C.A.R. landing field length over 50 ft. obstacle at max. landing weight:	6,400 ft.	6,400 ft.	6,280 ft.	6,280 ft.	5,500 ft.	5,500 ft.
Max. range with full passenger load:	4,400 mi.	3,900 mi.	4,500 mi. plus	5,250 mi.	3,300 mi.	3,300 mi.

* Approximate static thrust

† For maximum stage length

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Circle No. 16 on Reader Service Card.

A Giant Jet Industry Started This Way

Brief History of the 707

Aug. 30, 1952: First announcement that Boeing is engaged in privately-financed prototype jet transport project costing more than \$15 million.

May 14, 1954: Prototype is rolled from Renton, Wash., plant.

July 15, 1954: First flight from Renton Municipal Airport. Landing made at Boeing Field after flight of 1 hr., 24 min.

July 17, 1954: Prototype flies above 42,000 ft.; faster than 550 mph in third test flight.

Aug. 5, 1954: USAF announces it will purchase a number of advanced-design jet tanker-transports.

Sept. 1, 1954: KC-135 ordered into production.

July 13, 1955: AF advises Boeing that there is no objection to building commercial jet aircraft concurrent with military production.

July 28, 1955: Boeing moves to certificate 707.

Oct. 7, 1955: 707 averages 550 mph on 3,038-mile non-stop flight linking Seattle, Denver, Los Angeles and back to Seattle.

Oct. 13, 1955: Pan American World Airways orders 20 Model 707-120s.

Oct. 16, 1955: 707 averages 592 mph on non-stop Seattle-Washington, D.C. flight in 3 hr., 58 min.; makes return trip same day in 4 hr., 8 min., average 567 mph.

Nov. 9, 1955: American Airlines orders 30 Model 707-120s.

Dec. 1, 1955: Braniff International Airways orders 5 Model 707-220s.

Dec. 12, 1955: Continental Air Lines orders 4 Model 707-120s.

Dec. 24, 1955: Pan American announces 12 of its 707s will be Intercontinentals, with option for additional airplanes.

Dec. 28, 1955: SABENA Belgian World Airlines order 3 Intercontinentals; Air France orders 10 Intercontinentals.

Jan. 26, 1956: SABENA orders fourth Intercontinental.

Feb. 7, 1956: Trans World Airlines orders 8 Model 707-120s.

Feb. 23, 1956: Pan American increases its order to 23 airplanes—6 model -120s and 17 Intercontinentals.

Apr. 24, 1956: Lufthansa German Airlines orders 4 Intercontinentals.

Aug. 31, 1956: Air-India orders 3 Intercontinentals.

Sept. 6, 1956: Australian government authorizes purchase of 7 Model -120s by Qantas Empire Airways.

Oct. 24, 1956: British Overseas Airways Corp. orders 15 707-420s.

Mar. 7, 1957: Air France announces purchase of an additional 7 Intercontinentals bringing its total to 17.

Mar. 11, 1957: Prototype 707 flies 2,350 mi. non-stop from Seattle to Baltimore, Md., in the record time of 3 hr., 48 min.—average speed, 612 mph.

June 10, 1957: Cubana Airlines orders 2 707-120s.

Sept. 6, 1957: Varig Airlines of Brazil orders 2 707-320s.

Oct. 28, 1957: First production 707 is rolled from the factory at Renton.

Nov. 28, 1957: United Air Lines orders 11 720s.

Dec. 20, 1957: First production 707 flies.

Feb. 21, 1958: South African Airways announces it will order 3 707-420s.

May 15, 1958: USAF announces order for 3 707-120s, designated VC-137A, for MATS special missions division for use by the President and other high-ranking officials.

July 30, 1958: American Airlines orders 25 720s.

Aug. 15, 1958: Pan American World Airways takes delivery of first commercial jet airliner—a 707-120.

Sept. 10, 1958: Civil Aeronautics Administration certifies 707-120.

Oct. 26, 1958: Commercial transatlantic jet service begun by PAA with first 707 delivered.



MAY 14, 1954—Prototype 707 aircraft was rolled out for the first time at Renton, Wash., plant.



JULY 15, 1954—First flight of prototype from Renton Municipal Airport. Duration of flight—1 hr., 24 min.

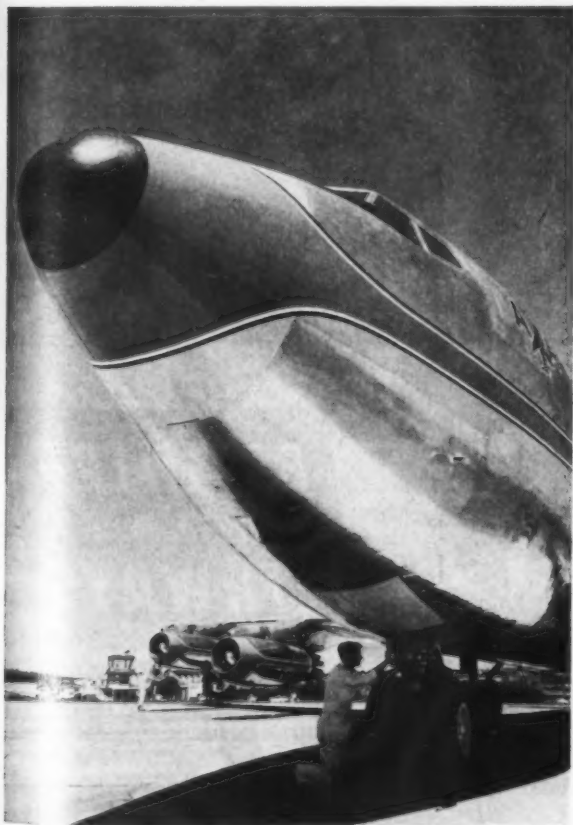


DECEMBER 20, 1957—First production 707 flies. Rollout of this aircraft took place at Renton on October 28, 1957.



AUGUST 15, 1958—First 707-120 is delivered to Pan American World Airways—two years and ten months after the

order was placed. This is the aircraft with which PAA began transatlantic jet service on October 26. Note spoilers and flaps on wing.



JULY 1, 1958—First American Airlines 707 is rolled out. Flown on October 5, 1958; delivered on October 23, 1958.



OCTOBER 16, 1958—American Airlines flight crews begin 707 training. AA starts jet service January 11, 1959.



TODAY—Boeing's assembly lines are filled to capacity with the beginnings of 187 aircraft now on order. →

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AIRTRENDS

The airline labor pot continues to boil furiously. The pilot's union—Air Line Pilots Association—is hot after Eastern, Pan American, American, Continental and T.W.A. Two basic issues are at stake. First is the question of higher pay, particularly higher pay for flying the new jets. Second is whether the third crew member in the cockpit of the new jets should be a flight engineer, a pilot or a combination of both. ALPA will hold a convention in Miami this week and some compromise solution may be developed on the impasses now vexing the industry.

Airline mechanics are on strike against Capital, and up in arms at Eastern, Northwest, T.W.A., National and Northeast. Basic issue is wages. In the Capital strike, for example, the Presidential emergency board recommended increases averaging 22¢ per hour over a two year period. The mechanics have been holding out for 42¢.

A 3% boost in domestic airline passenger revenues is estimated as result of Oct. 20 reduction of family plan discount to 33 1/3%, elimination of free stopovers and roundtrip, circle trip and open-jaw discounts. CAB allowed changes to be effective until July 31, 1959, same date the 4% plus \$1 interim fare increase terminates. (Board expects to issue its decision in General Passenger Fare Investigation before that time). Over the period of a year, Air Transport Association estimates that discount eliminations and reductions would increase gross passenger revenues by \$45 million. Some local service lines, incidentally, have retained on-line roundtrip discounts and free stopovers.

Slight increase in domestic trunks' passenger traffic was recorded in September over the same 1957 month. It was the second straight month to show a gain, after lows of May, June and July. September passenger-mile total was 2.1 billion, up 0.1%. Load factor continued to decline, showing 58.33% against 61.32% a year ago. For 12 months through September, passenger-miles were 24.62 billion, an increase of 2.7 billion over same period a year ago.

Impact of jet service: Pan American World Airways, which started daily New York-Paris flights Oct. 26 with Boeing 707s, reports 4,855 jet reservations on hand. BOAC says its Comet 4, now operating once weekly to London, is sold out for weeks.

Success of low economy fares on the Atlantic is seen by the fact that this class of service now accounts for 59.6% of total business. First-class and de luxe passengers make up 21%, tourist only 19.4%. Latter service is expected to disappear eventually.

Go now-pay later plans have been used by 120,000 people to buy \$50 million worth of air transport and travel services in last four years. Plans have been used primarily on North American continent, where installment buying is firmly established. About 70% of sales involve foreign travel at average of \$485 each, with 30% domestic at \$235 average. Default rate is said to be very low.

Defense Department may spend \$100 million for commercial airlift augmentation in fiscal 1959 if current spending rate continues. Total bill for contract and common carriage will reach approximately \$300 million of the total bill of \$530 million for the Defense Departments' airlift business.

The Pan Am-National jet lease question, with its related exchange of stock deal, is now before the Civil Aeronautics Board for decision. Oral argument before the Board resulted in charges that Pan American and National were at the threshold of a merger; charges that were vigorously denied by both carriers. In addition, Pan American hinted that if the CAB did not approve the exchange of stock, the leases would be withdrawn, although there is a good chance that the short term lease of jets to National for the coming Miami season may be approved promptly, with a further CAB decision to institute a full-dress investigation of the longer term lease and the proposed stock deal.

AIRTRENDS

Airport hotel operators are oblivious to noise talk and with reason. High occupancy rates of airport hotels speak louder than the purported roar and whine of arriving and departing aircraft. Jets spell new music with their high speeds and tremendous passenger-carrying capacity and hotel chains are responding with more units a building or in the planning state at major air terminals throughout the country.

Icy runways, bugaboo of pilot and airport operator alike, will come in for study and investigation by the Airways Modernization Board next year. An operations analysis of snow and ice removal has been programmed for inclusion in the fiscal 1960 budget. Program will be under Dr. Richard E. Jordan, director of operations analysis directorate of AMB, soon to be incorporated into the Federal Aviation Agency. Investigation will center around a study of the current situation with regard to snow and ice removal, and deal with such questions as the efficacy of present or available equipment, how much snow should be removed, and areas and direction in which improvement is indicated.

More time to pay off government hangar loans will be granted, depending on need. Maximum five-year maturity stated by Small Business Administration on hangar loans is not fixed and where conditions warrant, a greater length of time for loan repayment may be considered. Consensus of industry is that the present stated five-year term is too short on the basis of hangar construction costs and return which can be anticipated from hangar lease, based on prevailing rental rates. A ten-year period generally is regarded as the minimum over which costs can be reasonably amortized.

State legislatures still do not fully comprehend the importance of aviation. There is a lack of awareness of even such basic economic facts that more people today travel over the airlines than by rail or ocean liner. Civil Aeronautics Board Chairman James R. Durfee, for one, does

not believe "any state legislature has even a bird's-eye view of this explosively growing industry." Some states still lack an aviation department; in others, its value is yet to be fully recognized and exploited.

Aircraft will be landing on the foggiest nights as a matter of course within the next few years. This is the considered opinion of the International Air Transport Traffic Conference, based on systems already extensively eight tested by Bell Aircraft Corp., Buffalo, N.Y., and the Blind Landing Experimental Unit of the Ministry of Supply in the United Kingdom. Not yet developed in a form for civil aircraft operations, the two systems can land aircraft accurately and gently without the pilot's touching the controls.

Prudence may dictate the revision of many a projected airport plan or design in the light of taxiway tests recently completed by the Airways Modernization Board. Major findings: That conventional 90-degree taxiways limit runway acceptance rate and hence can be a limiting factor to an airport's capacity. Turn-off speeds of 60 to 65 mph were found safe and feasible for civil transport and military aircraft on wet and dry pavements. Aircraft included in the investigation were the T-29 (Convair 240), C-131 (Convair 340), R7V and C-121 (Super Constellation), KC-135, L-27 (Cessna 310), F-100, B-47 and XB-52. From these studies, taxiway configurations for speeds of 40 to 60 miles an hour and for turnoff angles of 30 to 45 degrees were developed and are included in the report titled "Exit Taxiway Location and Design," No. PB 151162. Copies will be available from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C., Nov. 7, at \$2.25 a copy.

Cut in avgas tax can be accomplished without sacrifice of revenue. Pennsylvania is a case in point. Total revenue from the state 1½-cent a gallon tax on aviation fuel in 1957 equalled the 1955 tax-take when the rate was 5 cents a gallon. The answer: More planes and more aviation fuel sold.

BOAC Strike Ends

Misunderstanding cost jet lead and nearly \$2 million

The crippling strike which tied up operations of British Overseas Airways Corp. for an 11 day period and in all probability knocked out the British carrier's chances of being the first airline to offer daily jet service across the Atlantic ended on October 21.

The walkout resulted from mechanics misunderstanding a statement to the effect that five workers had been dismissed because they refused to work overtime. The 4,000 engineers and mechanics involved unanimously agreed not to return to work until the men were put back on the payroll. The company reiterated that the five men were not dismissed. Officials said that a number of men had been informed that they would be dismissed if they did not work overtime should it be requested. The question of dismissal did not arise, however, because before any of the men were due to work overtime the engineering and maintenance employees walked out.

In announcing that the strike had been called off, officers of the company and the union said that both sides agreed to recommend a "full resumption of normal work . . . with no victimization on either side."

An additional factor in the strike was lack of progress in wage negotiations. Talks had been deadlocked for months, and part of the agreement reached in the settlement called for a continuation of these negotiations.

London sources agreed that the prime mover in the strike was two problems: A lack of communication between the parties involved, as well as within the union, is one and the ease with which communist and other agitators can exploit such a weakness is the other.

It is estimated that the walkout cost BOAC approximately \$280,000 a day for a total of nearly \$1,960,000.

ATA Operation-Engineering V.P., Milt Arnold, Resigns

In a surprise announcement at press-time, Air Transport Association president Stuart G. Tipton said he had submitted to ATA's board of directors the resignation of Milton W. "Milt" Arnold, v.p. operations-engineering effective November 30.

Arnold told AMERICAN AVIATION that he has made firm plans to accept another position and that it would be in the aviation industry, but he indicated that further details would not be forthcoming for several weeks. Arnold flatly eliminated the possibility

of assuming a government post such as might be available in the new FAA organization.

Milt Arnold joined ATA in 1946 and has headed up its complex air traffic control, airports, operations, engineering and maintenance activities since then. Before joining ATA, he gained extensive air transport experience in the USAF Air Transport Command and rose to the rank of brigadier general and chief of staff of ATC before retirement from active duty in 1946.

Airline-Labor Seesaw

Capital strike continues; Other carriers threatened

The seesaw battle between airlines and unions continued at presstime with no real concessions apparently being made in any of the current disputes.

Capital Airlines, strike-bound since October 16, reached no decision with the International Association of Machinists in their argument that has been going on for 13 months. Latest move was a "package" deal offered by the union, but which was turned down by Capital. After reviewing the offer, Robert J. Wilson, the airline's vice president handling the negotiations, charged that the IAM had not budged on wage demands, but had revived a large number of restrictive and costly rules which the Presidential fact-finding board had rejected in its report.

The union has countercharged that luxury items are unnecessarily being given passengers at the expense of employees.

Although there are 23 issues remaining to be solved, pay is the big problem. IAM has consistently requested 42 cents in increases spread over two years and the airline has offered 26 cents, six cents above the raise recommended last September by the Presidential board.

Negotiations are being conducted in Washington with Federal Mediation Board Member Francis A. O'Neill.

In other labor troubles, IAM had set a strike date for Friday, Oct. 31, against TWA and was in the midst of continuing discussions with Northwest Airlines. Disputes still exist between IAM and Eastern, National and Northeast.

Another thorny labor issue is over the problem of crew complement, a fight between ALPA's pilots and the Flight Engineers International Association. An ALPA meeting in Miami this week may partly resolve these issues. However, in past discussions the flight engineers have shown no inclination to listen to ALP arguments that, the third crew member should be a pilot.

PAA Fails in Move to Upset Equalization of Mail Rate

Pan American World Airways' attempt to upset a ruling of the U.S. Court of Appeals, which upheld CAB's decision to "equalize" the transpacific mail rate at the level applicable to Northwest Airlines, was denied by the U.S. Supreme Court.

Pan Am contended that the same service rate figured on the basis of Northwest mileage failed to meet the "fair and reasonable" standard and the Fifth Amendment "just compensation" standard. It claimed that fully allocated costs and a return on allocated investment were not covered. The Board argued that it was not required to fix a rate that is fully compensatory so long as there is no loss on overall operations. The U.S.-Tokyo route, which was in question, provides more income than any loss attributable to the carriage of mail.

Pan Am said that it was concerned over the lower court's ruling and that if the government can force a carrier to transport mail at less than compensatory levels there is no restraint to prevent commandeering mail service without any compensation at all. The Board was not concerned with this possibility.

Chief argument put forth by the Board was that Pan Am is better off with the lower rate than it would be with a higher rate since the Post Office will use the carrier with the lower rate. It declared that if Pan Am had a higher rate, it would find that Northwest Airlines was carrying the mail. The court agreed with this contention.

FCC May Reveal "Classified" Documents in Doppler Fight

Aeronautical Radio, Inc., Air Transport Assn. and industry petitioners have filed a motion with the U.S. Court of Appeals which would require the Federal Communications Commission to furnish supplemental transcripts of the record in the current battle over anti-collision and Doppler radar frequencies.

The motion cites a recent Act of Congress which provides that, where the correctness of findings by FCC are questioned, all evidence before the Commission be included in the record considered by the Court. The motion states that certain documents alleged to be classified were not filed with the Court, even though they were considered by FCC in entering the orders resulting in the frequency dispute. Industry petitioners include Bendix Aviation Corp., PAA, TWA and UAL, who took the matter to court earlier this month.

Cannes conference recessed . . .

IATA Jet Fare Fight Deadlocked

The hot fight over whether international airlines should be required to charge a higher fare for jets than for piston-engined planes remains unsettled, as the International Air Transport Association's traffic conferences recessed their meeting in Cannes, France.

Airlines were also unable to agree on a proposal for low developmental commodity rates on the North Atlantic to fill the expanded cargo capacity which the jets are expected to generate.

Both these issues will be discussed further at another meeting early next year.

Lack of agreement prevented the conferences from taking final action on fares and rates on the North Atlantic and other principal world routes on which jets will be introduced by Mar. 31, 1960, the end of the year under discussion.

Principal proponent of maintaining the same fares on jets as on piston

planes was Pan American World Airways. However, Alitalia, Iberia and Lufthansa were adamant that there should be a differential. Several other carriers did not take a position. Low commodity rates were pushed by PAA and KLM and were opposed by Seaboard & Western. All IATA votes must be unanimous.

The conferences reached agreement on more than 100 resolutions dealing with air transport in Asia and across the Pacific, and with other subjects. These will go to governments for approval.

Before recessing, it was learned that the conferences agreed that first-class one-way New York-London fare should be increased from \$435 to \$440, tourist from \$315 to \$320, economy from \$252 to \$257, sleeperette charge from \$50 to \$60, berth from \$75 to \$85. The IATA announcement also said there would be a "slight liberalization" of economy class conditions.

Philip Lawton, commercial director

of British European Airways, who was chairman of the conferences, said consideration of the jet fare problem "has been rendered difficult at this time by the lack of definitive operating cost data for the jets; some uncertainty as to how much jet capacity will be offered on various routes during the year under consideration; the absence of any real knowledge of the extent to which public preference may move from one aircraft type to another, and the fact that jet operators will themselves be flying propeller-driven aircraft over the same routes at the same time . . .

"Certain companies have not felt able at this time to accept any measure short of a surcharge on jets and have conditioned their acceptance of other fares and rate matters on this point.

"As a result of the discussion here, and after some weeks of actual operations, carriers should have a clearer idea of the probable, as opposed to the possible, results of the introduction of the jets. They will also have an opportunity to discuss these among themselves and we anticipate that an acceptable solution will be found when we reconvene."

AMB Research Tool: Runway Lighting Simulator

Improvement of landing visibility under low visibility conditions is being attacked by the Airways Modernization Board with the aid of a new research tool—a runway lighting simulator, consisting of a DALTO (Doman-Approach-Landing-Take-Off) simulator visual attachment and a flight trainer.

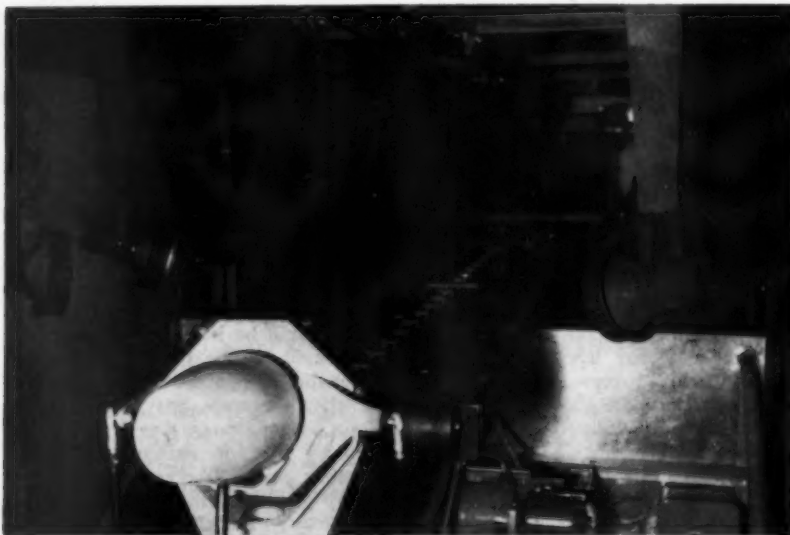
Installed at AMB's National Aviation Facilities Experimental Center, the new simulator is expected to speed up

analysis of visual aids and permit such investigations to be done at relatively low cost.

Painted fluorescent markings on a moving belt duplicate lights and markings seen by a pilot during landing and takeoff operations. A closed-circuit television system reproduces the image and projects it on a screen, so placed as to be visible through the windshield of a flight trainer. When the pilot of the

trainer "flies," signals generated by his "aircraft's" controls move the TV camera so that roll, pitch, heading, transverse movements and altitude are simulated, giving the pilot a realistic picture of the runway lights in relation to his "aircraft."

Weather effects are produced by using filters over the ultraviolet lamps used to energize the runway lights or marks on the moving belt.



MOVING BELT of the DALTO simulator has runway light configuration made up of fluorescent painted dots. TV camera is installed in housing in the foreground.



SIMULATED APPROACH and runway lights as seen by pilot in training.

VTOL-STOL Test Bed

Flap system and tilt-wing would give uncomplicated, vibration-free operation

Lockheed Aircraft Corp.'s CL-379 is a proposed aircraft test bed design for the Army offering STOL and VTOL capabilities and level-flight speeds comparable to World War II fighters.

Vertical lift would be obtained by increasing wing incidence approximately 20 deg., and utilizing the flap system to give moderate slipstream deflection. In this combination, Lockheed feels it has avoided the control problem and excessive vibration associated with pure tilt-wing designs, while eliminating the complex flap arrangement of slipstream deflection aircraft.

In initial studies, Lockheed considered both pure jet and turboprop powerplant installations for the 379. Because of range, weight, and low speed and altitude characteristics, Lycomings' T53-L-3 turboprop engine finally was chosen. It is rated at 1,005 eshp for takeoff at sea level standard conditions.

The twin-engine, two-place 379 has a conventional tricycle landing gear, actuated by the 3,000 psi hydraulic system. Slipstream deflection would be accomplished by a double telescoping flap design.

With the thrust line placed low to balance the nose down moment of the flap, blade clearance requires starting the engines with the propellers braked. The wing is then tilted to the desired position, and the brakes released.

In VTOL takeoff, the wheel brakes are held locked until the nose is raised to 20 deg. Full power is then applied, and the airplane is lifted off the ground. Transition to forward flight is made by gaining altitude, reducing the flap setting, and lowering the nose. As speed picks up, the wing incidence is reduced to zero.

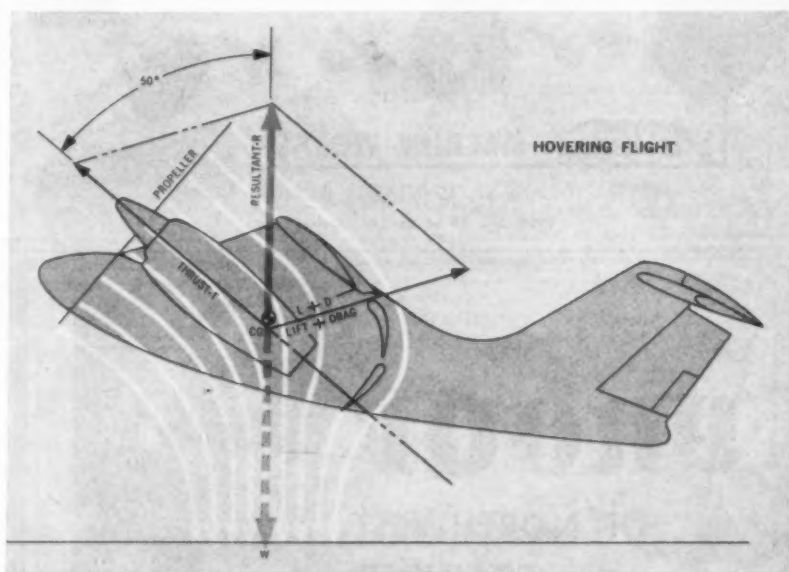
In hovering flight, roll is governed by differential pitch of the propellers, or spoilers in the flap system. Pitch is controlled by motion of the flap sections augmented by opposite motion of the leading edge slat, while yaw is controlled by differential motion of flap sections.

To accomplish VTOL landing, speed is reduced, wing incidence raised, and power added. The nose is then raised to the 20 deg. position, and power is gently reduced until touchdown.

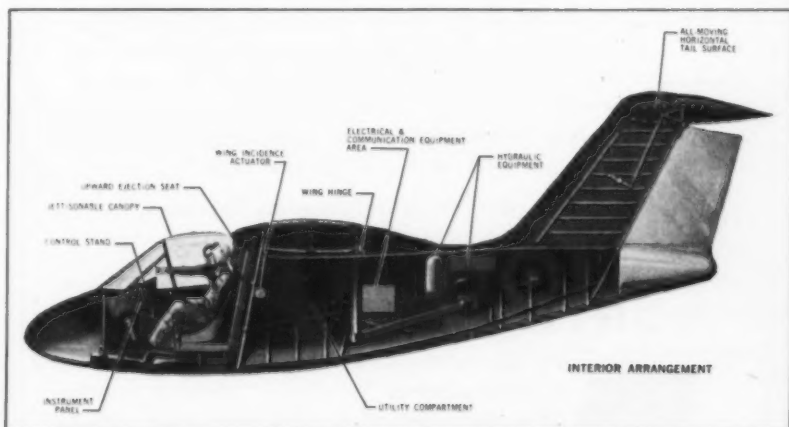
Presently in the wind tunnel stage of design, the CL-379 is not a proposal for an operational airplane. It is to be offered to the Army as a means of analyzing and testing STOL and VTOL principles.



LOCKHEED CL-379, smaller than current liaison aircraft, faster than WW II fighter.



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Historic Dissent

CAB turns down REA rate rise, but Hector dissent will have repercussions

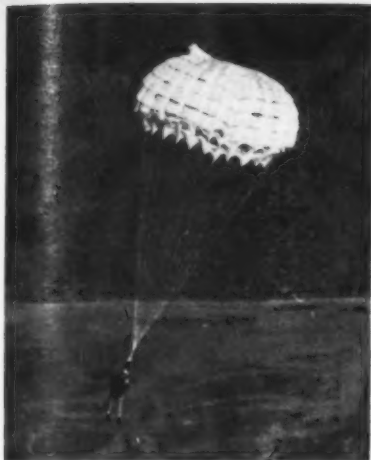
The Railway Express Agency failed in its attempt to gain Civil Aeronautics Board approval of slight rate increases on excess evaluation and COD charges, but drew a historic dissent from CAB Member Louis J. Hector that undoubtedly will be tossed back at the Board many times in the future.

REA had requested a rise from 18 to 19 cents per \$100 of declared excess evaluation and a 7% increase in COD charges. The Board, by majority vote, affirmed the initial decision of Examiner James S. Keith, which declared that the proposed increases would be unjust. The Board further held that REA had not presented evidence showing what the increased costs of services are, nor had it claimed that the present rate of 40 cents per ton-mile is inadequate. The decision left the burden of proof upon REA.

Striking out in direct opposition to the ruling, Member Hector disagreed with the findings. He declared that he would grant the requested rate boosts and that the Board was incorrect in ruling that the burden of proof belonged to REA. He said he was in agreement with the charge that leaving proof up to the Board or its counsel would inconvenience the Board's staff, but that to act otherwise would be contrary to the Administrative Procedures Act. He added that the Board has the power to get desired information.

Supporting his declaration that the burden of proof rested on the shoulders of the Board, Hector cited Section 7 of the Administrative Procedures Act. This he stated spells out that the proponent in a CAB rate case is not the party proposing a change, but is the Board, which asks for an order on the tariff if it disapproves it. The procedure act, he added, refers to an official action of a government agency in a rule-making proceeding.

Hector also cited the Interstate Commerce Act, the Motor Carrier Act and the Water Carrier Act, all of which place the burden of proving a rate just on the carrier. The Civil Aeronautics Act has no such clause and Hector contends that this omission was not an accident, but was done for a very specific purpose. Based on these clauses, he said that Counsel's decision was "based on erroneous principles of law" and "the majority opinion affirming the initial decision must find other grounds to do so."



Skysail Slotted Chute Cuts Opening Shock Load 35%

Developed for Navy by Radioplane division of Northrop Aircraft, Inc., this personnel parachute is designed for deployment at 15,000 ft. and 400 kts. with a reduction of about 35% in opening shock load. In tests, it has been opened successfully at 420 kts. Named "Skysail," the new chute's canopy consists of a series of rings with crescent shaped slots in each nylon gore, and is designed to open more slowly than existing types. Here, it's shown almost fully deployed.

... News Briefs

... Manufacturing/Military

• **Ramo-Wooldridge plant site okay**—After denying appeals of surrounding residents for additional restrictions, the Los Angeles city council voted unanimous approval of plans of Ramo-Wooldridge Corp. to erect an \$18,000,000 electronics establishment on a 50-acre tract in West San Fernando Valley. It was the first ordinance approved by the council under a special zoning for research and development projects.

• **Names in the news**—Lt. Gen. Donald L. Putt (USAF, retired) becomes chairman of the Air Force's Scientific Advisory Board. He is president of United Research Corporation, Menlo Park, Calif. As chairman of the AF Scientific Advisory Board, General Putt succeeds Lt. Gen. James H. Doolittle (USAF, retired), who has been named chairman of the Board of Space Technology Laboratory, AF system management contractor, and wholly owned subsidiary of Ramo-Wooldridge-Thompson Products, Inc.

• **Flying crane**—Sikorsky Aircraft Division of United Aircraft Corp. is building a flying crane, design of which was evolved from the S-60 twin-engine helicopter. Capable of lifting a six-ton



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... News Briefs (cont'd.)

payload, the craft is scheduled for first flight early next year. It will carry its cargo externally in slings or hoists.

• **Name in the news**—Max Golden, long-time Air Force procurement specialist and formerly Deputy Assistant Secretary-Materiel, is the new Air Force general counsel, succeeding J. A. Johnson who is now general counsel to NASA.

• **Second Paris flies**—Beech Aircraft Corp. has flown a second Morane-Saulnier MS 760, four-place, twin-jet business aircraft. It will be used as a company demonstrator. Coincidentally, the first South American-assembled MS 760 made its first flight October 27 at Cordoba, Argentina—the day prior to the Beech demonstrator.

• **New Piper Apaches, Tri-Pacers**—Piper Aircraft Corp. has announced new versions of the single-engine PA-22 Tri-Pacer and twin-engine PA-23 Apache for 1959. Major changes in the Apache include a redesigned instrument panel, which results in placement of all radio equipment in the center panel, flight instruments on the left directly in front of the pilot, and auxiliary instruments on the right. Noise

level internally and externally has been much improved with the installation of glass fiber insulated exhaust augmenters, thicker windshield units and side windows and more soundproofing material around the cabin section. Both feature 160 hp Lycoming O-320-B engines and new exterior color designs. Higher priced models have a built-in automatic flight system as standard equipment.

... Transport

• **WCA contract signed**—West Coast Airlines and the Air Line Agents Association have signed a contract granting wage increases ranging from \$30 to \$55 a month. Retroactive to August 1, 1958 and extending to June 1, 1960, the agreement provides increased sick leave, improved bidding procedures and a top level of pay for station agents of \$400 a month. Some 200 employees come under the contract.

• **New service**—The Flying Tiger Line inaugurated a nonstop Super Constellation all-cargo trip from the West Coast to New York to meet shipper demand.

• **Stratocruiser route**—Transocean Air Lines will use four Boeing Stratocruisers it bought recently to fly transcontinentally to connect with its U.S.-Hawaiian flights and for tour and charter groups. Planes will operate from New York via Chicago to Los Angeles and San Francisco once weekly. The Stratocruisers are part of 14 returned by BOAC to Boeing in a financing deal under which BOAC will buy 15 Boeing 707s.

• **WAL procedural battle won**—Western Air Lines won a two-year battle to elect its board of directors by straight voting instead of the cumulative voting method. A Delaware Chancery Court ruled that WAL should hold a stockholders' meeting before Jan. 20, 1959, to elect the board by the straight voting method. As a result of the ruling, two dissident members of the board may be excluded from the slate management will propose. The two, who favored cumulative voting, are William S. Bartman, Los Angeles, and Gordon Y. Billard, New York.

• **Name in the news**—Daggett H. Howard, Air Force's deputy general counsel, was appointed general counsel of the new Federal Aviation Agency, first staff appointment made by E. R. Quesada, whose appointment as head of the agency was announced by the White House last month. Howard formerly was a member of CAB's legal staff.

• **American's earnings**—American Airlines' net earnings for first nine months of 1958, including profit from sale of equipment, was \$13,325,000 against \$10,148,000 for same 1957 period. Change in depreciation policy ordered by CAB resulted in increase of \$3,350,000 in earnings this year. Passenger-miles were down 2.3% compared with last year.

• **PAA employment trimmed**—Pan American World Airways by yearend will furlough 223 copilots and 166 flight engineers due to "schedule adjustments."

• **Non-IATA low fares**—Icelandic Airlines (Loftleidir) is now advertising "lowest transatlantic fares" of any carrier for the off-season. The non-IATA line offers New York-London round-trip (DC-4) of \$392.20, against IATA economy class of \$453.60. Fares to other European points are also below IATA levels.

• **States-Alaska investigation suspended**—CAB voted unanimously to suspend indefinitely further action in its States-Alaska Air Services Investigation.

• **EAL extends "package" deals**—Eastern Air Lines this year for the first time will extend its Florida package vacations through the winter months, with 70 resort hotels cooperating by quoting minimum winter rates starting Jan. 1.

Orchids to Boeing...



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FLY-BOY? Nope, just WWP in a Boeing KC-135 jet tanker at Seattle.

Ever been to Saranac Lake-Lake Placid in the Adirondacks of upper New York State? Used to be served by Colonial, now Eastern. Several years ago I went to a convention up there but the airport was fogged in for two days straight and I went by limo to and from Plattsburg.

Recently (July 28) I tried a second time—and made it. When I left New York on an Eastern Silver Falcon, the weather could hardly have been worse, but originating flights were taking off okay. Not until we neared Albany were we out of thick soup. Capt. R. H. Hamann was running the show, and a personable purser by name of Robert Olson, whose voice is one of the few that can come through clearly on the intercom, kept me supplied with coffee.

At Glens Falls, along the upper Hudson River, the weather was still lousy and I wondered if we'd get into Saranac. But we did, and it wasn't raining. I had about four hours with nothing to do while waiting for the next flight back to Albany, so John Campe, senior agent, gave me some ideas about where to go in town. Campe worked for Eastern in Washington for six years and put in an early bid for Saranac when Eastern took over Colonial. His home is at nearby Tupper Lake. Francis Crofton, the manager, was in Atlanta attending a schedule meeting.

That's fine country up there, even when overcast. Jim Shapiro, who is airport manager and operates North County Airways, has been doing well with charter work and gas sales since he took over two years ago. (He's going to host an OX-5 convention soon.) There are plans for adding a thousand feet to one of the 4,000-foot runways and there are hopes that Eastern will use Connies in due course. Eastern has improved service a lot and business has gone up nicely.

In mid-afternoon I hopped on a southbound flight to Albany, where I made a quick transfer to a Mohawk Convair bound for Utica, thanks to R. J. Miller, of Mohawk. Eastern was running late; the connection was pretty tight.

New \$3-million Base

Utica is the new headquarters for Mohawk and, when the new \$3-million base opens late this year, it will be the finest local carrier setup in the country, bar none. Oneida County is building the hangar and offices and Mohawk has to put out very little money, except rent. Bob Peach, president, and John Carver, v.p. and general counsel, took me on a tour of the unfinished building. The 120-foot reinforced concrete spans for two hangar areas are most unusual. From what I could see, this is the best-planned local airline headquarters anywhere.

My stop at Utica had another purpose besides seeing the new base. I was aiming to hit the only remaining stop on the Mohawk system, Ogdensburg, up along the St. Lawrence River, and the last stop in my hobby north and east of Washing-

—EN ROUTE—

Wayne W. Parrish

Among the Indians in Darkest New York... Via Mohawk

ton except for two on Northeast. It was raining and the northbound flight was late out of Newark because of traffic control. Peach, Carver and I were joined by Helen Thomas, executive assistant, for a steak sandwich in the small terminal cafe, but if that was a steak I'm the new senator from Alaska. A new terminal and a new coffee shop are being built at Utica and all I can say is they need them.

Some two hours late Capt. E. N. Johnson pulled in with his DC-3 from Newark, having been in the soup all the way, and in a driving rain I got on board wondering if we'd ever get to Ogdensburg. It was now getting dark. About 20 minutes out of Utica, before we reached Watertown, the low rain clouds disappeared and the high overcast permitted views of the Thousand Islands (where Bob Peach has recently bought a 7-acre island, lucky guy).

The St. Lawrence Seaway construction brought good business to Mohawk, but more than that, it is attracting new industry up that way. Ogdensburg has turned out to be a good stop. D. J. "Squire" McGee is the Mohawk manager, a bouncy fellow wearing smiles. He got his nickname during the war. Capt. Johnson made a quick turnaround and we skipped Watertown on the way back, having picked up southbound passengers on the way up, and made up some time to Utica. 1st Officer was A. Pasternak and the flight agent was J. B. Whitman.

End of the Line

Utica was the end of the line for that night, for me, and unexpectedly also for Newark-bound passengers. The New York area was closed down. Peach was on hand to drive me to the Hamilton Motel, a very fine establishment on the outskirts of the town.

At the goshawful hour of 5:15 a.m., I was awakened to get ready for an early breakfast prior to departing on the first Convair to Buffalo. Ronald Krause, publicity director, picked me up at the motel and we drove to the apartment of Bob Sidney, director of community and public affairs. Bob had the coffee ready and turned out some fine bacon and eggs.

Krause was on his way to Erie. I got off at Buffalo to be met by Jay Shuler, who manages AAP's Quick Reference Guide and directs preparation of quick reference manuals for various airlines, at Springville, N.Y., about 35 miles south of Buffalo Airport. This was my first visit to the enlarged and vastly improved Buffalo terminal. What a change from that old inadequate building!

Mohawk now has eleven Convair 240s. Some of the CAB people have criticized the line for putting on too much big equipment, but any observer of traffic and operations in the Mohawk area learns pretty fast that DC-3s and even the F-27s, which will be ideal in many parts of the country, can't do the job on the main segments, some of which were taken over from American. Some of Mohawk's routes are in heavy-density traffic patterns, serving important industrial cities. The DC-3 is hopelessly outmoded on such routes. Only Convairs or Martins are capable of handling the traffic at peak hours.

Mohawk is one of the top local carriers in passengers carried. North Central passed it to gain first place, and Allegheny gives it a good run for second place. Not generally known is the fact that the Grange League Federation, of Ithaca, N.Y., world's largest independent farm cooperative, owns about 40% of the company.



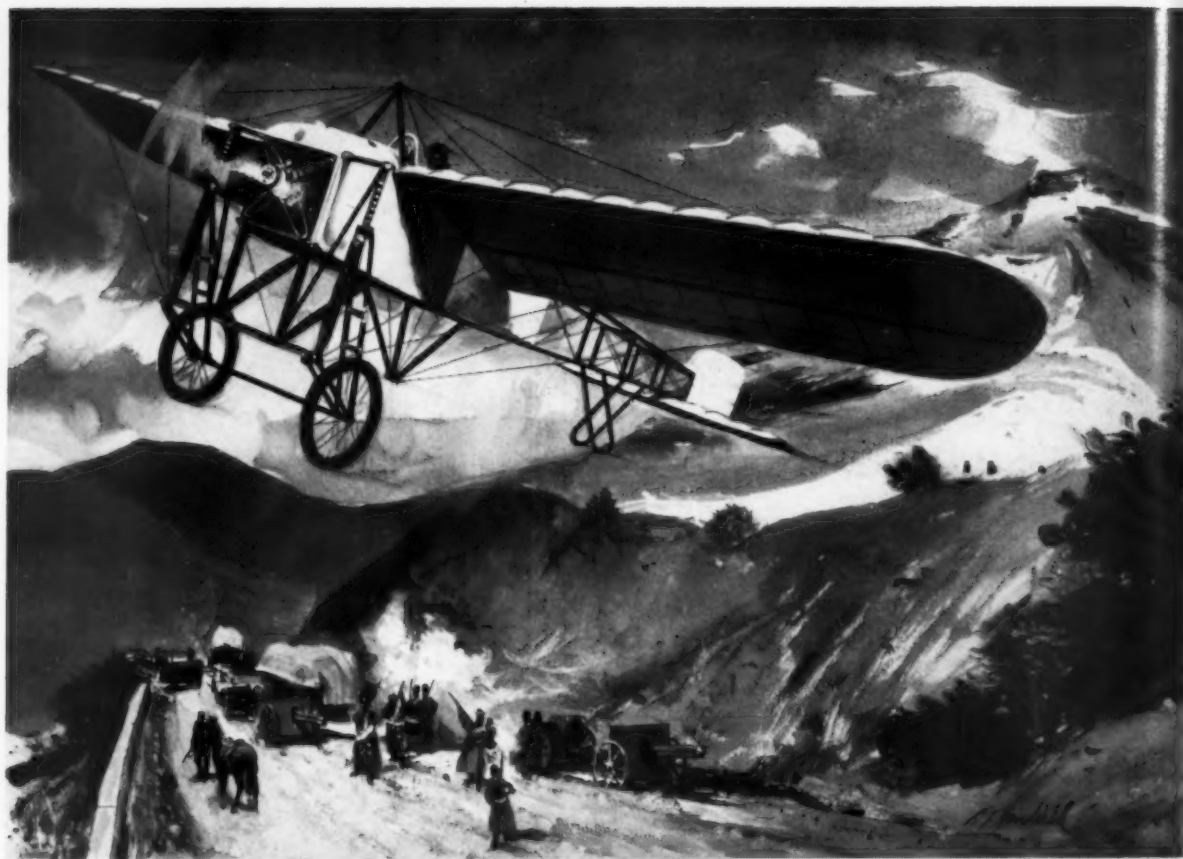
AT EGLIN FIELD, FLA., WWP pays call on Maj. Gen. Joe Kelly, new commanding officer of the big USAF base there, while on a Southern Airlines tour last August.



THE U. S. ARMY will use Hamilton Standard Hydromatic propellers for its Grumman AO-1 *Mohawk*, a new turbine-powered observation aircraft. This is another example of Hamilton Standard's leadership in the design, development, and production of propellers and other equipment for more than 50 types of turbine-powered aircraft and missiles.



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Early military flying . . . Bert Hall and his late model Bleriot on a reconnaissance mission early in 1913 during the Turkish-Bulgarian War.

Early War Birds- THE BLERIOT

The epic first flight across the English Channel in 1909 by an early model of this French plane established the basic form for future aircraft. Henceforth, most planes would use the same configuration of a tractor propeller, forward wing surfaces, and after, vertical and horizontal stabilizers. In fact, Louis Bleriot's plane was such a sturdy and dependable flier that improved models of the original were used in World War I as reconnaissance planes until the late spring of 1915, and after that as trainers.

It was in a two-seater Bleriot, powered by a 50 h.p.

Gnome engine and with speed of approximately 60 m.p.h., that the American Bert Hall (later renowned for his exploits with the Lafayette Escadrille) did some of the earliest military flying on record. From February to April of 1913, he and his mechanic, Andre Pierce, flew reconnaissance and artillery-spotting missions for Turkey in a war against Bulgaria. In spite of Bert Hall's aerial snooping and occasional low swoops to scare the Bulgars' horses, the Sultan's forces lost. But two months of dependable flying by his Bleriot heralded the coming of military aviation.



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